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INSULIN AND DIABETES.

A GENERAL STATEMENT OF THE PHYSIOLOGICAL AND THERAPEUTIC EFFECTS OF INSULIN.

BY

J. J. R. MACLEOD, M.B., CH.B.ABERD.,

PROFESSOR OF PHYSIOLOGY, TORONTO UNIVERSITY.

Early Investigations.

LÉPINE[1] was the first to suggest that the condition of diabetes which von Mering and Minkowski[2] had discovered to follow pancreatectomy might be due to the withdrawal of an internal secretion necessary in the normal animal for the complete metabolism of sugar. The subsequent discoveries that extracts of certain ductless glands, such as the adrenals, have marked pharmacological actions, and that administration of extracts of others, such as the thyroid, can relieve the symptoms which are associated with atrophy of that gland, gave indirect support for the view that the pancreas must also yield an internal secretion. This view was also greatly strengthened by the results of experiments in which it could be clearly demonstrated that a subcutaneous graft of pancreatic tissue is capable of preventing diabetes when the remainder of the pancreas is removed. Many attempts were made to obtain direct proof of the presence of this hormone; thus diabetic animals were given extracts of pancreas prepared in various ways, or blood from the pancreatic veins of normal animals was injected into them, but with no definite benefit. The extracts prepared by Starling and Knowlton,[3] by Murlin and Kramer,[4] by Kleiner,[5] and by E. L. Scott[6]—to mention only a few of the investigators—did not yield results that were considered by these authors to be sufficiently positive to justify an immediate further development of their investigations with a view to using the extracts in the treatment of diabetes in man. The hope that, in spite of these more or less unsatisfactory results, a method would some day be discovered for the preparation of a pancreatic extract capable of alleviating the symptoms of diabetes was sustained by the publication from time to time of researches the results of which could be interpreted only by assuming the presence of a pancreatic hormone. Among the most striking of these investigations may be mentioned those of Clarke,[7] who discovered that the isolated mammalian heart—kept alive by perfusing its blood vessels with Locke's solution containing glucose—removes sugar from the perfusion fluid much more rapidly when the fluid used had first of all been perfused through the blood vessels of the pancreas than from fresh Locke's solution. In the light of these researches the majority of investigators concluded that a pancreatic hormone must exist, but that it was impossible to detect its presence in pancreatic extracts because of its destruction by the trypsin and other proteolytic enzymes also present in them.

Starting-point of the Recent Advance.

The problem therefore was to circumvent these enzymes, and to Dr. F. G. Banting is due the credit of suggesting that this might be accomplished by taking advantage of the well-known fact that the cells which secrete the digestive enzymes become completely degenerated in some weeks after ligation of the pancreatic ducts, whereas those of the isles of Langerhans, which apparently secrete the antidiabetic hormone, remain more or less intact. He undertook to see whether extracts of the degenerated gland might yield more certain results, and facilities and assistance were afforded him in my department to put this suggestion to the test of experiment. In collaboration with C. H. Best, Banting observed the effects produced by injection of the extracts on the percentage of sugar in the blood, as well as on the total sugar excretion in the 24-hour urine of dogs, rendered diabetic by extirpation of the pancreas.[8] From practically the very start of the observations a definite lowering of both of these values was observed to occur. The observations were frequently repeated with all necessary controls, and it was further noted that the exhibition of the extract also greatly improved the subjective condition of the animal and markedly prolonged its life. An untreated depancreatized dog seldom lives beyond three weeks—or four at the outside—whereas with the extracts one such animal lived in excellent condition for ten weeks, when it was killed by chloroform. No trace of pancreas could be seen by the naked eye *post mortem*, though a very small nodule of zymogenous cells was found in the walls of the duodenum in a careful microscopical examination.

First Therapeutic Application.

Having shown by these experiments that the pancreas does contain an antidiabetic hormone the next step was to find a method by which an extract containing it could be made from undegenerated gland. Knowing that proteolytic enzymes are almost, if not entirely, absent in the foetal pancreas (Ibrahim), Banting and Best[9] prepared extracts from this source, and, finding them also to contain the antidiabetic hormone, then proceeded to try whether an active extract could be prepared from the pancreas of the full-grown ox, by using alcohol as the extracting medium so as to circumvent the destructive action of trypsin, as had previously been suggested by E. L. Scott. Satisfactory results were obtained, and it was considered that the time had now arrived to warrant the administration of the extract to a diabetic patient. This was done in the case of a boy of 14 years suffering from the usual severe type that is so common at this age. The percentage of blood sugar was reduced by about 25 per cent. This may be considered to mark the close of the first and fundamental step in the discovery of insulin, the name which, following Sir E. A. Schafer's suggestion, has been given to the internal secretion of the pancreas.

Preparation of Insulin.

The presence of a hormone capable of alleviating the symptoms of diabetes both in laboratory animals and in man having been definitely established, it remained to devise suitable methods for the preparation in quantity of an extract containing it and to investigate thoroughly the extent and nature of its physiological and therapeutic actions.

Since the extract used by Banting and Best in the clinical observation referred to was found to cause a certain degree of local irritation, it was necessary, before further clinical trials could be undertaken, to prepare it in purer form. This was successfully accomplished by Dr. J. B. Collip by a method of fractional precipitation with alcohol, the principle of which is described elsewhere,[11] and which in all essential details is the one now used for the preparation of insulin in larger quantity. At this stage of the work it also became necessary to find some simple, readily available laboratory method for testing the potency of the preparations of insulin. Without some method of physiological assay it would have been extremely difficult to develop a satisfactory method of preparation on a large scale, because the potency of each precipitate and filtrate in the process of fractional precipitation of the crude extracts had to be tested before the next step in the preparation was taken.

Pharmacological Assay.

Moreover, a method of pharmacological dosage had to be devised to serve as a guide for the clinical dosage. These requirements were met by the discovery that insulin lowers the percentage of blood sugar in normal rabbits.[12] The rate of development, as well as the degree of this hypoglycaemia, depends somewhat on the method of injection (whether subcutaneous or intravenous), on the state of nutrition of the animal, and, of course, on the body weight; but we have found it satisfactory to consider as one unit the amount of insulin which, on subcutaneous injection, can lower the percentage of blood sugar to 0.045 within four hours in a rabbit weighing about 2 kg. from which food has been withheld for sixteen to twenty-four hours. The final solutions of insulin prepared in the University for clinical use are usually concentrated, so that 1 c.cm. contains one unit. The reason why 0.045 was chosen as the percentage to which the sugar should become lowered is that at this level, almost without fail, the animal develops highly characteristic symptoms consisting of violent convulsive seizures with intervals of coma. These symptoms finally terminate in death, but if the animal be injected subcutaneously with dextrose (gram per kilogram) it immediately recovers and usually remains without further symptoms; occasionally a relapse may occur, which, however, can again readily be antidoted by dextrose. No other sugar has the same effect, although a temporary alleviation of the symptoms has sometimes been observed after injections of galactose and laevulose.

Associated Effects of Insulin.

These discoveries, to which Dr. Collip contributed much, opened the way to more extended physiological and clinical investigations. E. C. Noble, J. Hepburn, and J. K. Latchford joined in the physiological investigations, and by excellent team work it was possible in a comparatively short time to

demonstrate many other effects of insulin, a few of which may be briefly alluded to here because of their importance in showing the fundamental nature of its action.

The first step was to extend the investigations of Banting and Best on depancreatized dogs so as to include observations of the respiratory quotient, and the urinary excretion of acetone bodies.[11] The former of these is a ratio expressing the relationships of the amount of CO_2 excreted and of O_2 retained by the animal, and it is a reliable qualitative index of the type of metabolism, being of the value of about 1 when carbohydrates are the chief foodstuff undergoing metabolism, 0.7 for fats, and 0.8 for proteins. When diabetes is of the severest type, as in dogs after the removal of the pancreas, the quotient often falls below 0.7, and it is not raised to any significant degree when carbohydrate foods are given. This was found to be the case in the depancreatized dogs used in these investigations, but when insulin was given along with the sugar the quotient immediately rose decidedly, indicating that the power to metabolize carbohydrate had been restored.

Effect on Excretion of Acetone Bodies.

The excretion of acetone bodies in a diabetic dog is not relatively so large as in severe cases of diabetes in man, and it is somewhat irregular. When insulin was given, however, the acetone bodies entirely disappeared from the urine and remained absent so long as the administration was maintained.

Effect on Fat Metabolism.

Very significant results were obtained by comparison of the percentage amounts of glycogen and of fat in the liver and heart in untreated and insulin-treated diabetic animals.[11] When no insulin was given the glycogen content of the liver was found to be very low—not more than 1 per cent.—whereas that in the heart was decidedly above the normal; after insulin (and sugar) the percentage of glycogen in the liver rose to the exceptionally high value of over 12 per cent., and there was a decided fall in the percentage in the heart. The fat content of the liver fell from about 12 per cent. in untreated animals to below 5 in those treated for two days with insulin, and there was also a decided diminution in the fat content of the blood. These observations indicate that insulin, possibly because of its influence primarily on carbohydrate metabolism, also affects that of fat.

Influence on Carbohydrate Metabolism.

In the long series of chemical processes which enter into the metabolism of the carbohydrates there are only two products which are sufficiently stable to permit of quantitative determination: these are the sugar of the blood and the glycogen of the liver. In diabetes the former increases and the latter decreases, and insulin restores them to, or beyond, their normal levels. Taking this along with the fact that oxidation of the glucose molecule, as revealed by the respiratory quotient, fails to occur in diabetes, but does occur, as in a normal animal, when insulin is given, it is evident that this hormone must be an essential factor in the regulation of carbohydrate metabolism. Not only, however, does insulin remove the symptoms of diabetes due to absence of insulin from the body, but it also prevents the development of the hyperglycaemia, and presumably of the glycosuria, which can be induced by other experimental means.[13] The best known of these are puncture of the floor of the fourth ventricle of the medulla, subcutaneous injections of epinephrin, and the various forms of asphyxia, including ether anaesthesia. In rabbits previously fed abundantly with carbohydrate rich foods so as to ensure a high percentage of glycogen in the liver, none of these experimental procedures was found to cause more than a slight increase in the blood sugar in animals previously injected with insulin. The only one of them which could cause any decided degree of hyperglycaemia after insulin was that due to excessive doses of epinephrin, and it is possible that a method for the precise dosage of insulin based on its power to antidote known quantities of epinephrin may be evolved. That insulin almost entirely prevents the development of hyperglycaemia in ether anaesthesia has an evident practical application in surgical practice.

Effect on Cardiac Nutrition.

As to the mechanism of the action of insulin we are as yet in the dark. One other fact of great importance may, however, be mentioned—namely, that it increases the rate of sugar consumption by the isolated mammalian heart.[14] These observations were made on the hearts of rabbits. Immediately after killing the animal the heart was excised and perfused through the aorta with Locke's solution containing about 0.2 per cent. of glucose. From time to time samples of this fluid were removed for determination of the percentage of reducing power. When no insulin was added to the perfusion fluid the average rate of disappearance of sugar was 0.8 mg. per gram of heart per hour; when insulin was added to the fluid the average was over 3 mg. It was not possible to determine whether the more rapid disappearance of sugar under insulin was due to its increased combustion or to its being deposited as glycogen in the heart. This it will be possible to determine only by observing the respiratory quotient in a heart-lung preparation, such as has been used by Starling and his collaborators.

Mode of Action of Insulin.

This observation on the heart would seem to narrow down the locus of action of insulin to the muscular tissue, and we therefore hoped to find that we could demonstrate that addition of insulin would accelerate the rate of disappearance of glucose from incubated (Buchner) extracts of muscle. So far, however, the results have been entirely negative, although with Dr. G. S. Eadie's assistance we have repeated them in various modifications of the experimental conditions. Neither does insulin have an influence on the rate of disappearance of glucose from drawn blood (glycolysis), nor on the rate at which glycogen is broken down in incubated pieces of liver. The object of doing these experiments is not only that some light might be thrown on the mechanism of action of insulin, but also that some *in vitro* method might be discovered for measurement of the potency of insulin.

Insulin in Diabetes Mellitus.

The effects of insulin in removing the cardinal symptoms of diabetes in depancreatized dogs, as well as those observed on normal rabbits, have been found also to follow its administration in the disease, diabetes mellitus, in man. Every detail of the therapeutic effects of this hormone was definitely forecasted by animal experimentation—the effect on the blood sugar and on the urinary sugar, the diminution of acetone bodies (to which the incidence of fatal coma is related), the prolongation of life, the raising of the power to metabolize sugar—and it was not until this had been established beyond doubt in the laboratory that insulin was given in the wards. Without the experimental demonstration of its effects no physician would have been justified in attempting the therapeutic investigation of insulin. Had he attempted to do so unguided by the results of observations on rabbits, it is almost certain that sooner or later an overdose would have been given, causing convulsions (not unlike those of diabetic coma itself) for which there would have been no indication as to what remedy should be used. The experiments on rabbits, however, showed clearly that these alarming symptoms are immediately antidoted by injection of glucose, and it is of interest that in one or two patients in whom there have been premonitory indications of their possible occurrence exhibition of glucose has immediately and permanently removed them.

A preliminary paper on the principal clinical effects was published in March by Banting, Best, Collip, Campbell, and Fletcher,[15] and since that date a sufficient number of cases of all degrees of the disease have now been observed—partly in the clinic of Dr. Banting at the Christie Street Hospital of the Soldiers' Civil Re-establishment in Toronto, partly in the clinic of Professor Duncan Graham in the Toronto General Hospital, and partly in certain diabetic clinics in the United States—to justify the statement that when insulin is administered subcutaneously in adequate dosage it is capable, within a remarkably short time, of removing the cardinal symptoms of the disease for a period of several hours. To suppress the symptoms permanently, however, the injections must be repeated, the practice at present being twice daily. So long as the administration is maintained the patient is able to assimilate much more carbohydrate than previously, and he gains weight and with it both physical and mental vigour, so that the despondency and apathy that are so prominent in these cases disappear. Whether the diabetic condition is in any degree cured by the rest which is given to the damaged pancreatic function by insulin cannot as yet be stated. It is perhaps in the adolescent forms of the disease that these results have been most marked, but there

can be no doubt that when insulin comes to be more available its exhibition along with intelligent control of diet will have the same beneficial results in all the serious forms of the disease. In cases of threatened coma its value is undoubted, and this is also the case when it is used as a precautionary measure against post-operative risk in surgical practice.

Until the clinical effects have been more thoroughly investigated it would be out of place here to discuss in further detail the therapeutic value of insulin.

Preparation on the Large Scale.

It remains to explain the steps that have been taken by the University of Toronto to safeguard the production, standardization and distribution of insulin. Realizing that the publication of the method of its preparation might be followed by an uncontrolled commercial exploitation of insulin, with the consequence of its improper use in general practice, the chief originators of the method generously offered to apply for patents covering its production, and to hand these over to the University provided this body would assume the function of licensing approved manufacturers to produce and sell it at a reasonable cost. Patents have therefore been applied for in Canada, the United States, Great Britain, and other countries, and the University has appointed a committee, composed partly of those who have participated in the investigations and partly of members of the Board of Governors, to advise it with regard to the conditions under which licences should be granted.

As a first step this committee recommended that licences should not be freely granted until every possible detail of the manufacture on a large scale of a preparation of known and constant potency had been thoroughly worked out. This step was taken because of the unexpected difficulties which were encountered when large scale production was attempted in the Connaught Antitoxin Laboratories of the University. It was found that whereas non-irritating preparations of insulin of constant potency could readily be obtained by Collip's procedure in the laboratory, the yields were for some time extremely unsatisfactory when a large scale production was attempted.

Protection from Commercial Exploitation.

After these difficulties had been overcome it was decided still further to expand the production by collaborating with some firm engaged in the manufacture of extracts from slaughterhouse materials. This was done under a special agreement by which the University undertook not to issue licences to other firms until the lapse of a period during which the large scale method could be carried out so as to yield the maximal output of preparation of standard and uniform potency both when assayed by the rabbit test and when tested therapeutically on diabetic patients. For the clinical assays this firm agreed to distribute a sufficient number of free samples of their preparation to various physicians specializing in the treatment of diabetes in properly controlled clinics. This collaboration between the committee of the University and a firm in the United States is proceeding at the present time, and the physicians receiving insulin are reporting their experiences as to its potency and value. Whenever it is certain that a thoroughly reliable large scale method for a product of constant potency has been worked out the special agreement between the University and the collaborating firm will terminate, and the University will issue licences to other approved firms.

Realizing that it could not exercise proper supervision over the production of insulin in more countries than Canada and the United States, the University has offered to the Medical Research Council the assignment of the patents applied for in Great Britain for the purpose of safeguarding the production and standardization of insulin in that country.

REFERENCES.

[1] Lépine: *Le diabète sucré*, Paris, 1909, p. 54. [2] Von Mering and Minkowski: *Archiv. f. exp Path. u. Pharm.*, 1889, xxxi, p. 371. [3] Knowlton and Starling: *Journ. Physiol.*, 1912, xlv, 146. [4] Murlin: *Journ. Biol. Chem.*, 1913, xv, 365. [5] Kleiner: Ibid., 1919, xl, 153. [6] Scott, E. L.: *Amer. Journ. Physiol.*, 1912, xxix, 3. [7] Clarke: *Johns Hopkins Hosp. Reports*, xviii, 229. [8] Banting and Best: *Journ. Lab. and Clin. Med.*, 1922, vii, 251. [9] Banting and Best: Ibid., 1922, vii, No. 8. [10] Banting, Best, and Macleod: *Proc. Amer. Physiol. Soc.*, December, 1921. [11] Banting, Best, Collip, Macleod, and Noble: *Trans. Roy. Soc. Canada*, 1922, vol. xvi, Sec. V. [12] Banting, Best, Collip, Macleod, and Noble: *Amer. Journ. Physiol.*, 1922, lxii, 162. [13] Banting, Best, Collip, Macleod, and Noble: Ibid., 1922, lxiii. [14] Hepburn and Latchford: Ibid., 1922, lxii, 177. [15] Banting, Best, Collip, Campbell, and Fletcher: *Canadian Med. Assoc. Journ.*, March, 1922.

Remarks
ON THE
SURGERY OF THE PITUITARY GLAND.*

BY
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[*With Special Plate.*]

EVEN in adult life the two portions of the pituitary gland remain distinct, and each appears to have a very different function. Their somewhat complicated development will therefore have to be briefly considered before discussing the manifestations of disease of the gland.

DEVELOPMENT.

In the adult the pituitary gland forms a small oval structure, which is somewhat flattened from above downwards, and fills the pituitary fossa of the sphenoid bone. Its longest diameter, which usually lies transversely, is about half an inch. On section it can be seen to be distinctly formed of two parts, an anterior and a posterior. The anterior portion, often described as the epithelial or glandular part, is in man considerably the larger, and forms about two-thirds of the total gland. It is immediately in front of, and in part envelops, the posterior lobe, which may be regarded as being embedded in its posterior surface. Blair Bell has shown that this position is largely dependent upon the shape of the fossa, for in animals with a deep fossa, such as the cat, the pars nervosa lies posteriorly; while in dogs, which have a shallow fossa, it is placed superior to the glandular part. The glandular portion is developed from the stomadeum at a very early age from a recess, known as Rathke's pouch, which grows upwards from the junction of the pharyngeal membrane with the roof of the primitive stomadeum, and which, according to Bell, may be visible even in a foetus of 2.5 mm. Such a method of development is remarkably constant within the vertebrate series, and may be found in some form even as far back as the Cyclostomata. The pouch so formed passes upwards in front of the notochord and between the trabeculae cranii to the base of the brain. The neck of the sac becomes constricted, but the upper portion dilates to form what is known as the pituitary sac. Later, as the sphenoid develops, the stalk becomes constricted and disappears, so that the pituitary sac is entirely shut off from the stomadeum. The position of this stalk is usually regarded as lying between the pre-sphenoid and post-sphenoid, but Cope has shown that it traverses the anterior part of the post-sphenoid. Although the stalk by these means is as a rule entirely destroyed, Duffy has shown that certain squamous-celled tumours which arise in or about the pituitary probably originate in the remnants of this stalk, which may persist in the post-sphenoid or beneath the capsule of the anterior lobe. Erdheim has reported a case of acromegaly in which a tumour formed of cells resembling those of the anterior lobe was imprisoned in the posterior part of the sphenoid. The pituitary sac thus cut off from the primitive pharynx undergoes very considerable proliferation. It becomes more or less triradiate in outline, and later gives off a large number of diverticula, so that it comes to have a glandular appearance.

The fully developed anterior lobe comes therefore to be composed of well-defined epithelial cells supported by a framework of fine connective tissue and showing large blood vessels and sinuses. Not uncommonly the cells are arranged in the form of small vesicles containing a granular-like material somewhat resembling colloid. The work of Bell and Cushing, among others, shows that there is a very great variation in the appearance of this portion of the gland in different physiological and pathological states. It can always be determined, however, that there are two main types of cells: one of these stains well and is spoken of as the chromophil cell, which may be either basophil or acidophil; the other stains poorly, and is spoken of as the neutrophil or chromophobe cell.

The anterior lobe appears to become larger and more active in certain conditions — such as during pregnancy, after

* An abstract of this paper was presented to the Section of Surgery at the Annual Meeting of the British Medical Association at Glasgow.

thyroidectomy, and after castration. It is also always larger in adult parous females than in men or nulliparae.

The posterior part, or pars nervosa, has an entirely different origin. Shortly after the appearance of Rathke's pouch a depression is seen in the floor of the forebrain. As development proceeds this pouch dilates while its stalk becomes constricted. The dilated portion comes into close relationship with the posterior surface of the anterior lobe and is in part enveloped by it. As it grows its wall becomes thickened, and as a rule the cavity entirely disappears, but occasionally a small part may remain as a minute vesicle which is still lined by ciliated columnar epithelium. The stalk, unlike that of the anterior lobe, does not disappear but persists as the infundibulum or stalk of the pituitary gland. This is attached above to the anterior part of the tuber cinereum, which is a thin layer of grey matter alone separating the pituitary fossa from the cavity of the third ventricle. Indeed, a small pouch of the third ventricle is continued downwards into the upper part of the infundibulum. In adult life this portion of the gland is seen to consist of cells and fibres which are apparently neuroglial in character. Occasionally large cells, apparently from the pars intermedia, may be seen in the substance of the pars nervosa, and generally there can be distinguished a peculiar brown pigment.

It has been shown that as the anterior lobe develops the original pituitary sac throws out buds which by irregular growth form the glandular-like anterior lobe of the pituitary. The posterior wall of the sac remains, however, simple and comes to lie in close relationship with the infundibulum of the posterior lobe, while the pituitary sac itself persists as a narrow cleft which appears to separate the anterior from the posterior lobe. This thin posterior wall of the sac remains epithelial in character and is usually spoken of as juxtaneural epithelium. This portion forms in the adult the pars intermedia. It is developmentally a portion of the anterior lobe, and it and the anterior lobe are generally spoken of together as the hypophysis. Like the rest of the gland, it varies very considerably in its size and extent in different animals. In man the epithelium is very scanty, and only forms a thin layer over the pars nervosa, where it adjoins the narrow cleft. The cells are faintly granular and either neutrophil or slightly basophil. A colloid-like secretion is sometimes found in this part and also in the cleft. Whereas the anterior lobe has a very fair blood supply from the internal carotid arteries, the pars intermedia appears to contain no blood vessels or lymphatics.

Anatomy.

The anatomical relations of the gland are of extreme importance surgically, and it is owing to the inaccessibility of the fossa and to the importance of the surrounding structures that surgical measures have been so limited in the past.

The gland itself lies in a deep hollowed-out fossa in the sphenoid bone, and therefore lies in the centre of the base of the cranium and almost equidistant from the root of the nose and the posterior margin of the foramen magnum. The shape of the fossa varies considerably. Cope has shown that the antero-posterior measurement is from 7 to 14 mm., the transverse from 9 to 15 mm., and the depth from 3 to 10 mm. Immediately beneath it the basisphenoid is hollowed out by the presence of the sphenoidal sinus, but both the size of the pituitary fossa and the size of the sphenoidal sinus are subject to very considerable variation. Gibson, who took careful tracings of 107 skulls, found that the sphenoidal sinus was completely absent in 3 per cent., very small in 9 per cent., and was separated from the sella turcica by a thick anterior wall in 9 per cent. What is perhaps of more importance surgically is that he was able to show that the sinus did not project below the sella turcica in 22 per cent. of the cases. The sphenoidal sinus not infrequently shows an intersphenoidal septum which is variable in its position, and may be so much to one side that if taken for a guide in an intranasal operation it may lead to one of the cavernous sinuses being opened in mistake for the pituitary fossa. The floor of the sphenoidal sinus is formed laterally by the cornua sphenoidalia and medially by the ethmoidal spine, to which is attached the vomer bone. It will thus be seen that any approach to the pituitary fossa by the intranasal route, which is the operation of choice, is not only associated with considerable difficulties owing to the variations in the anatomical conditions, but, the opening being small, it is impossible to remove completely any of the larger tumours in this region.

The bony floor of the fossa is slightly concave and is limited laterally by a slight ridge of bone which separates it from the carotid groove. Posteriorly the cavity is overhung by the dorsum sellae, which separates it from the pons Varolii and the basilar artery. The upper portion of this ridge projects on either side and overhangs the pituitary fossa to form the two posterior clinoid processes. Anteriorly the fossa is limited by a transverse ridge of bone, the olivary eminence or tuberculum sellae, which is often continued outwards laterally into two small spurs of bone—the middle clinoid processes. These middle clinoid processes limit posteriorly the groove for the carotid artery where it turns upwards from the cavernous sinus. Sometimes the middle clinoid processes may be sufficiently long to join with the anterior clinoid process and thus convert the carotid groove into a canal. In front of the olivary eminence is the optic groove, which terminates on either side in the optic chiasma. The pituitary fossa thus formed is lined by a layer of dura mater and is covered in above by a fold of the same structure, which is the diaphragma sellae. This is complete except for a small opening in the centre through which passes the infundibulum.

The pituitary, therefore, lies in a closed box, which anteriorly, posteriorly, and inferiorly is formed of bone, and above and on both sides is formed of dura mater. Each lateral wall is separated to enclose the cavernous sinus containing the carotid artery, the third, fourth, sixth, and branches of the fifth nerves. Just external to the third division of the fifth nerve is the middle meningeal artery. These lateral relationships of the pituitary are of considerable importance and make an approach to the gland by the temporal route a difficult and dangerous procedure. To obtain adequate access by this route it would be necessary to lift up the temporal lobe and with it the optic tract, and to open the diaphragma sellae above and internal to the cavernous sinus. Separating the structures of the interpeduncular space from the base of the skull and the pituitary fossa is a large subarachnoid space, the cisterna basalis, through which passes the infundibulum. Anteriorly the fossa is in part shut in by the anterior clinoid processes and the olivary eminence, and it is said that sometimes they may project so far over the pituitary fossa as to make approach by the anterior or frontal route difficult. In practice, however, this is found not to be the case, for by lifting up the frontal lobe it is always possible to reach to the bottom of the pituitary fossa.

Running transversely across the front of the gland in the optic chiasma and at a somewhat higher level is the anterior communicating artery. Antero-laterally are the carotid arteries turning forwards and the optic tracts. Although the optic chiasma lies close to the bone it will nearly always be found that a tumour of the pituitary elevates the chiasma from the bone, and presents in the triangular space between the two optic nerves. Thus it often happens that at operation, although a tumour the size of a walnut is readily removed and the floor of the pituitary fossa freely exposed, yet the optic chiasma has been pushed so far upwards and backwards that it is not seen in the operating field.

The arterial relationships to the gland are of considerable importance. Posterior to the dorsum sellae runs the basilar artery, which divides superiorly to form the two posterior cerebral arteries. Running forwards from these arteries close to their origin and encircling the infundibulum are the two posterior communicating arteries, which join the internal carotid arteries almost immediately after they have appeared above the middle clinoid process. They thus lie upon the diaphragma sellae and the superior surface of the pituitary gland. The two internal carotids pass upwards and give off the anterior cerebral arteries, which are united by the anterior communicating artery. It will thus be seen that the posterior communicating arteries run beneath the optic tracts, whereas the internal carotid and the anterior cerebral arteries run external and superior to the optic nerves. Hence a pituitary tumour, pushing upwards the optic chiasma, will compress the optic nerves between itself and the anterior ring formed by the circle of Willis. We therefore have an explanation as to why it is that sometimes a pituitary tumour will give only a bitemporal hemianopsia and sometimes will lead to complete optic atrophy and blindness.

Functions.

That the internal secretions of the pituitary gland have a very important bearing upon the general metabolism has been known for a considerable period, but accurate knowledge has

been almost wholly developed since Marie's observations in 1888 upon the changes in the gland that were found associated with acromegaly. This knowledge is in part based upon observations of the effects of administered extracts of pituitary, partly upon experimental operations upon animals, and partly upon observations of the changes found in certain physiological and pathological states. At one time it appeared as though the whole of the patient's appearance and character might depend upon slight changes in this small gland. More recent work makes it evident, however, that there is a very real interrelationship between this and other glands in the body, for under certain circumstances the whole of the gland may be removed and only beneficial effects will result.

A study of the internal secretion of this gland is associated with peculiar difficulties, for not only do the anterior and posterior parts appear to have entirely different functions, but the effects will differ according to whether the changes occurred before or after puberty. There is still, therefore, some uncertainty as to what are the parts played by the individual portions of the gland, for both experimentally and clinically it is difficult to obtain a lesion which is limited to one or other lobe. There even seems to be a certain amount of doubt as to what is the effect of complete extirpation of the gland. The evidence produced by Cushing would seem to show that complete destruction of the gland is incompatible with life, but Sir Victor Horsley brought forward a considerable amount of evidence to show that an animal could survive this operation. My own experience is very definite. I have two cases in which the gland has been completely extirpated; the pituitary fossa at operation was left absolutely bare and lined with smooth dura. Both these cases have survived and have made very good progress. It would appear, therefore, quite certain that the function of the gland can be almost wholly undertaken by other glands in the body.

The Anterior Lobe.

Since Pierre Marie first pointed out that cases of acromegaly were always associated with changes in the pituitary gland a large amount of evidence has accumulated to make it perfectly definite that this portion controls the metabolism and growth of the skeleton, including the bones, cartilage, and connective tissues. If there is an increase in the internal secretion before growth is completed the patient will develop into a giant. There will be a very great overgrowth of the bony skeleton, which, however, is rarely if ever symmetrical, and the patients will generally show not only structural weakness but many of the irregular outgrowths which are found in all cases of acromegaly. Should the oversecretion be delayed until adult life then there will be an irregular overgrowth of the bony and connective tissue, giving rise to that curious syndrome known as acromegaly. In addition to these clearly defined effects upon the skeletal tissues it is probable that an overgrowth of the gland is associated with changes in the sexual glands, for most cases of acromegaly are clearly asexual. It is possible also that the anterior lobe may to a certain extent control the deposit of fat.

Pars Intermedia.

It is very difficult, if not impossible, to distinguish the functions of this portion from those of the posterior lobe, but Evans holds the view that the pars intermedia produces a colloid-like material which affects the blood pressure and the urinary secretion. It may lower or raise the blood pressure and may increase or decrease the secretion of urine. It is held by many observers that all the effects which are described as due to changes in the posterior lobe are really due to changes in the pars intermedia, for it is difficult to see what secretion, if any, could be formed from the posterior lobe, which is apparently made up of neuroglia alone.

The Posterior Lobe.

It is a curious fact that whereas the functions of the anterior lobe are shown clinically to be so distinct, those of the posterior lobe are less well defined, yet extracts are much more easily prepared from the posterior, probably with the pars intermedia, and have a very definite effect. So far no demonstrable changes have been seen to follow the administration of extracts of the anterior lobe, although Goetsch has claimed that the administration of such extracts leads in young animals to an increase in the rate of growth and early sexual development. The effects of extracts of the posterior lobe are many, and may be grouped as follows:

1. *A Pressor Effect.*—Howell in 1898 first showed clearly that it was the posterior lobe extracts alone which gave pressor effects. This has since been confirmed by many observers, who show that this pressor effect is due to a slowing and increase in force of the heart's action. Second and subsequent injections given soon after the first have little or no effect until the first has all been destroyed or excreted by the organism. The effect is maintained for a much longer period than that obtained by suprarenal extract.

2. *A Depressor Effect.*—It has been noted by many observers that an injection of this portion of the gland may lead not to a rise but to a fall in the blood pressure. Schafer and Vincent noticed that this fall followed second and subsequent doses if they were given soon after the first. Others have noticed that such a depressor effect followed shortly after the pressor effect had died away. Blair Bell, on the other hand, has shown that there is a preliminary fall before the blood pressure rises. It is this uncertainty as to the relationships between the pressor and depressor effects that has made the use of this drug in the treatment of surgical shock not entirely free from danger.

3. *A Diuretic Effect.*—Magnus and Schafer first showed that injections of posterior lobe extract had a diuretic effect. With this they observed that the arteries of the kidney were dilated, whereas the arteries of the rest of the body were constricted. The diuretic effect was not, however, simply a vascular phenomonon, for later Schafer and Herring showed that it was present even when general vaso-constriction was absent. Herring also showed that this effect was produced entirely by the pars nervosa and not by the whole posterior lobe. It is not, therefore, as has sometimes been thought, due to pressure upon the fourth ventricle.

4. *A Galactagogue Effect.*—The use of extract of the posterior lobe has come into considerable favour for its value in increasing the flow of milk in lactating women. Blair Bell points out that the effect is so rapid that it would seem improbable that it is due to the active principle being excreted by the gland and so stimulating the cells. It is an interesting point, however, that the increased flow is only of short duration and that the daily flow does not seem to be increased in amount. The increased flow shows a slight increase in the amount of fat, but is otherwise normal. The later excretion, however, shows a slight diminution in the amount of fat, so that the total excretion, like the total quantity, is not increased. Blair Bell holds the view that the increase in the rate of expulsion is simply due to the effect upon the muscle fibres, so that there is in reality an increased excretion rather than an increased flow.

5. *A Stimulative Effect upon Unstriped Muscle.*—One of the most valuable effects of pituitary extract is its power of causing rapid and powerful contraction of unstriped muscle. Bell has shown clearly that although the extract has no effect upon the resting uterine muscle it causes powerful contraction of the uterus in menstruating and pregnant animals. It has thus been largely used in gynaecological work. Similar powerful effects have been found in the case of the intestinal muscles, and the drug is now very largely used in many forms of ileus. A similar effect is seen upon the muscular wall of the bladder.

6. *Effects upon Carbohydrate Tolerance.*—Many diseases of the pituitary gland are associated with a very distinct and definite change in the patient's tolerance to carbohydrate, so that not infrequently there has been noticed the presence of glycosuria. There is some doubt as to which portion of the gland is responsible for this effect. It may be said to have been definitely established that with lesions such as acromegaly there is a diminution in the tolerance to carbohydrates. One of my own patients, who was a clear case of this disease, had a marked glycosuria. Lesions of the posterior lobe, on the other hand, show as a rule an increased tolerance, but it is not possible to say definitely whether the effect is due to over- or under-secretion. It might be possible that in acromegaly the glycosuria is due to overaction of the anterior lobe or due to underaction of the posterior lobe owing to the pressure of the enlarged anterior part.

PATHOLOGY.

In some of the cases in which the clinical symptoms clearly indicate that there is a diminution in the secretion of

the pituitary a skiagram may show that this fossa is smaller than normal. Few, if any, of these cases have had the pituitary examined, but the smallness of the fossa and the absence of local pressure symptoms would indicate that the symptoms are due to a simple atrophy of the gland. In the majority, however, the pituitary fossa is much enlarged, and this is true whether the symptoms are those of increase or decrease. If the symptoms are those of increased secretion there is an overgrowth of the pituitary gland which has a positive function, but where the symptoms point to a diminution of the secretion there may be a tumour such as a fibroma or sarcoma of the pituitary itself, or a neoplasm of the surrounding tissue which has caused local pressure symptoms and widening of the pituitary fossa, but having no internal secretion leads to a destruction of the pituitary with a diminution of its secretion. A similar condition may be found with cysts, and in my own experience the majority of the cases of hypopituitarism are found associated with a cystic change.

Much attention has been given to the nature of the pathological lesions found with an increased secretion. Cope has analysed 64 cases which were published by Cushing, Hirsch, and von Eiselsberg. Of these 64, 45 were adenomata and 7 were cysts. Others have been certified as endotheliomas, mixed tumours, epithelial cancer, sarcomas, etc. It is probable, however, that the majority of these latter were really adenomata. Such tumours are very richly cellular and give a microscopic appearance which is very suggestive of a carcinomatous change. They are, however, quite localized, are not associated with secondaries, and would seem not to recur after complete removal. Frazier has also laid stress upon the great variation in the published reports of the pathology, and in many which are reported as malignant there has been no evidence of recurrence or of secondary deposits after a number of years. Sekiguchi has carried out an interesting investigation in cases that had died of mammary cancer. In two such cases he found that there were secondary deposits in the posterior lobe, and in both cases the patient had polyuria, which he regards as being due to compression of the pars intermedia by pressure of the secondary deposits in the pars posterior. It may be said, then, that the majority of cases that show an increased secretion are due to the presence of functioning adenomata. When there is clinical evidence of a diminished secretion the lesion is most commonly a cyst or a parapituitary tumour, but may occasionally be due to a simple atrophy. The diagnosis of the latter type is simple, for there will be no local pressure symptoms and a skiagram will show a diminution rather than an increase in size of the pituitary fossa.

Clinical Manifestations.

There are certain diseases in which it is well established that there is a lesion of the pituitary gland, but there are others in which the evidence is much less certain. Cope, for instance, has shown that there is a close relationship between the pituitary and the thyroid, and that a diminution in the thyroid gland may be associated with an overgrowth in the pituitary. He has found that the fossa may be enlarged in cases of cretinism and is often considerably enlarged with achondroplasia. In the well-established cases the pituitary lesion will give rise to symptoms which may be placed in three groups. There are, first, those which are dependent upon some alteration in the secretion, which is either diminished or increased, and according to whether this variation in the secretion occurs in early or adult life so will different symptoms arise. Secondly, there are symptoms due to local pressure of the enlarged pituitary on the surrounding tissue. Lastly, there are a group of symptoms which are due to a general increase of the intracranial pressure.

Disturbances of Internal Secretion.

There are still many points of doubt as to which portion of the gland is actually at fault with individual disease, and not uncommonly curious combinations of symptoms may be found. It is possible, for instance, that an adenoma of the anterior lobe will give rise to an increased secretion in this portion, but at the same time the tumour might cause a pressure atrophy of the posterior lobe and so give rise to symptoms of hypopituitarism. Such a combination of Fröhlich's disease and acromegaly has been reported by Frazier and another by von Eiselsberg. It is therefore not yet possible to say with certainty what symptoms correspond with different lesions of the gland, but it is probable that the following classification is a correct one:

Classification of Symptoms.

Anterior Lobe:—

(*a*) Increase of function: (1) In young patients = gigantism. (2) In adults = acromegaly.

(*b*) Decrease of function: (1) In young = ateliosis (Lorain's disease), possibly achondroplasia. (2) In adults doubtful; possibly fragilitas ossium.

Posterior Lobe:—

(*a*) Increase of function: Doubtful; possibly some forms of precocious development and some cases of congenitally high blood pressure.

(*b*) Decrease of function: (1) In young = dystrophia adiposo genitalis (Fröhlich's disease). (2) In adults = adiposis dolorosa.

Gigantism.

The relationships of gigantism to lesions of the pituitary gland have been well appreciated since Sternberg showed that 20 per cent. of acromegalics were giants and 40 per cent. of giants developed acromegaly. Cushing has reported several cases of giants with lesions of the pituitary gland, and it has been realized that a similar change existed in many of the well-known giants. It is also interesting to note that very few of these so-called giants are normally developed. Most of them show an unusual size of the hands and feet, and many of them, although so big, show many of the irregular changes in growth which are associated with acromegaly. For instance, they often have very long arms and legs, irregular overgrowth of the facial bones, and marked kyphosis. Brissaud was the first to point out that acromegaly was probably gigantism of adult life, or that gigantism could be regarded as acromegaly occurring during the period of growth. He also showed that examples of acromegaly and gigantism might be found in the same family.

Acromegaly.

This condition has been so frequently described, and so many cases have been reported since Pierre Marie's first complete description in 1886, that it will suffice to give a very brief account of the clinical condition.

In nearly all cases there is a definite change in the pituitary gland which takes the part of an adenomatous overgrowth. Even in the few cases that have been reported where acromegaly has occurred without any visible change in the gland, it is probable that a microscopic examination would show a definite overgrowth, as in cases reported by von Eiselsberg. As a general rule the disease commences after the age of 30, and males and females appear to be almost equally affected. There is a remarkable similarity in the appearance of all such patients. The face as a whole shows general hypertrophy, especially in the vertical direction. The forehead appears low and narrow, the orbital margins are much enlarged and thickened, and a skiagram will show an increase in size of the frontal sinuses. The temporal areas appear to be depressed. The nose is widened and enlarged, the upper jaw shows slight overgrowth, and there is marked hypertrophy of the lower jaw. With this enlargement of the inferior maxillary there is a separation of the teeth, so that in time they come to form an arch greater than that of the upper teeth. The jaw itself projects and is enlarged from above downwards. The tongue is hypertrophied and the ears are somewhat thickened and enlarged. The lips are thickened and often appear to be negroid in type. A skiagram will reveal some thickening of the tables of the skull and considerable overgrowth of the orbital margins and jaws. The pituitary fossa is enlarged and the clinoid processes may be eroded. The spine shows a definite kyphosis and some of the patients may have a distinct increase in height. In three of my patients, although adults, the height had increased from one to three inches since the onset of the disease. The thorax is enlarged, widened, and deepened. There is a wide subcostal angle. The pelvis is enlarged in all directions and the bones are generally thickened. Perhaps the most characteristic change is that in the hands and feet. They are generally increased in size, especially in the lateral direction. The patients will often have noticed that since the onset of the disease they have had to take much larger boots and gloves. The thickening consists of all the tissues. At first the soft tissues are enlarged so that the fingers are more or less cylindrical, the hands wider, and the heels thicker. The toes, like the fingers, are cylindrical, and the foot is much wider at the base of the toes. At this stage a skiagram will show no

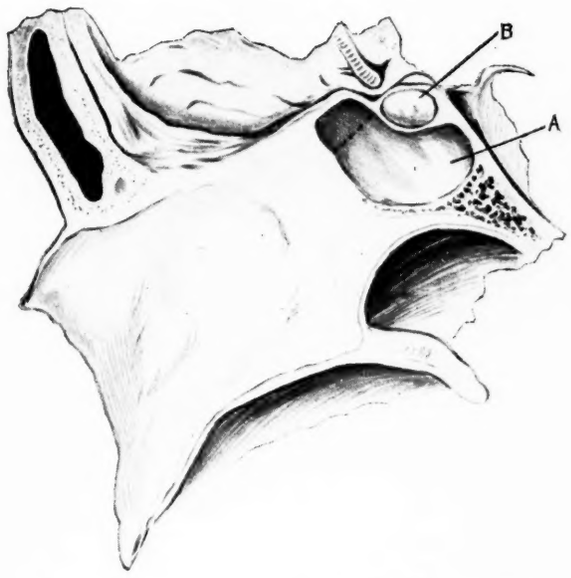

Fig. 1.—The inferior relationships of the pituitary fossa. A, Sphenoidal sinus. B, Pituitary gland.

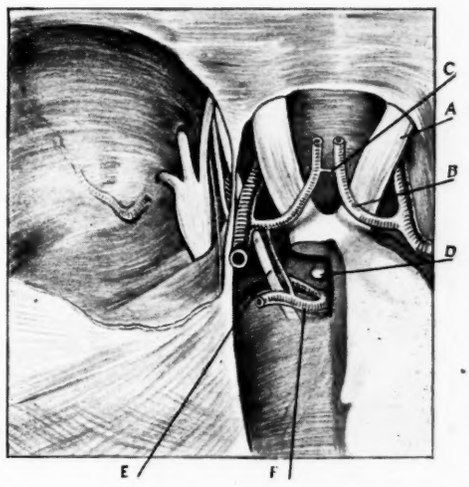

Fig. 3.—The superior and lateral relationships of the pituitary gland. A, Optic nerve. B, Anterior cerebral artery. C, Anterior communicating artery. D, Pituitary gland. E, Third nerve. F, Posterior cerebral artery.

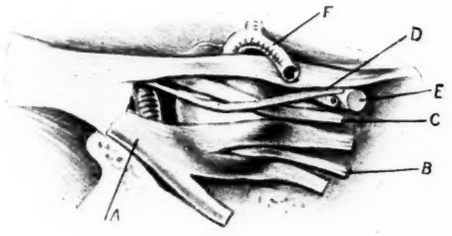

Fig. 2.—The lateral relationships of the pituitary gland. A, Fifth nerve and Gasserian ganglion. B, Sixth nerve. C, Third nerve. D, Fourth nerve. E, Optic nerve. F, Middle cerebral artery.

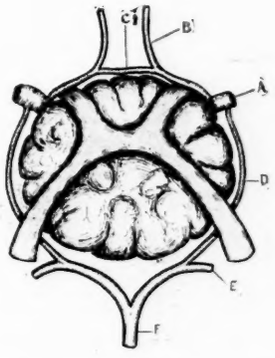

Fig. 4.—Relationships of the circle of Willis to a pituitary tumour. A, Middle cerebral artery. B, Anterior cerebral artery. C, Anterior communicating artery. D, Posterior communicating artery. E, Posterior cerebral artery. F, Basilar artery.

Fig. 5.—Case v. Acromegaly before operation.

Fig. 6.—Case v. Acromegaly five months after operation.

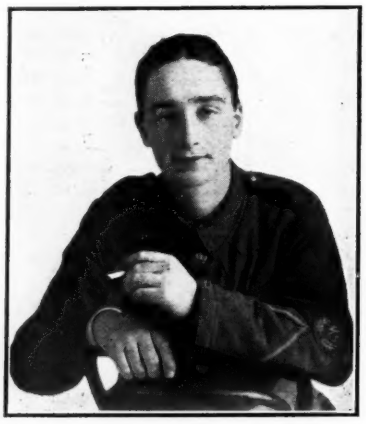

FIG. 7.—Case VI. Acquired Lorain, aged 19. Before onset of symptoms.

FIG. 8.—Case VI. Acquired Lorain, aged 23. Day before operation.

FIG. 9.—Case VI. Acquired Lorain. Three months after operation.

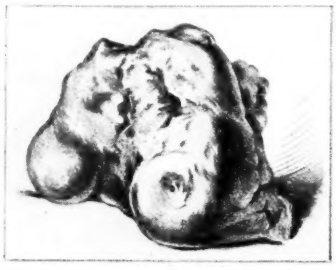

FIG. 10.—Case VI. Acquired Lorain. Pituitary tumour removed by frontal route.

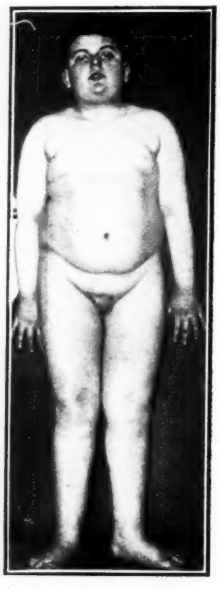

FIG. 11.—Fröhlich's disease.

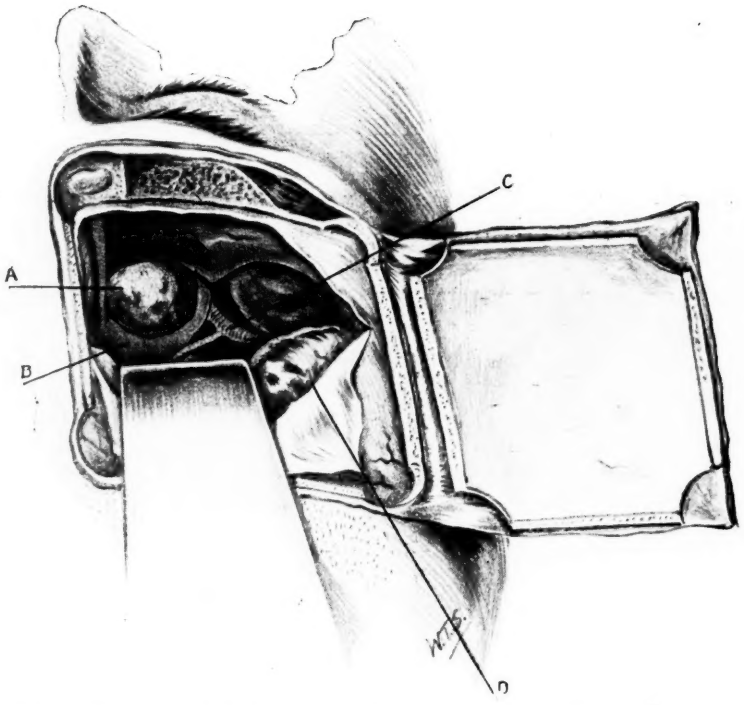

FIG. 12.—Exposure of pituitary tumour by frontal route. A, Tumour of pituitary gland. B, Optic chiasma. C, Middle cerebral artery. D, Frontal lobe of cerebrum.

evidence of any bony change, but later there is a subperiosteal overgrowth, especially of the proximal phalanges. In advanced cases there may be a hypertrophy of the muscles of the arms and legs, which later is replaced by an atrophy, and the *x* rays will show a deposit of new bone beneath the periosteum of the long bones. Sexual changes are definite. In women the breasts atrophy and amenorrhoea is an early symptom. The external genitalia are hypertrophied and there is a decrease in sexual desire. The heart is often hypertrophied. The thyroid may be small and the larynx hypertrophied, so that in women the voice becomes deeper and stronger and resembles that of a man. The skin may show profuse sweating and pigmentation, and the hair becomes coarse and wiry. The intelligence is as a rule good, but later, when there is evidence of general pressure, the mental functions may be impaired. The patients will often complain of severe, but ill-defined, pain in the limbs, back, and joints. Local or general pressure symptoms may be present in addition, and it is not uncommon, as in one of my cases, for glycosuria to be present and to require treatment before an operation is undertaken.

Ateliosis, or Lorain's Disease.

This condition may be regarded as the exact reverse of gigantism. The condition generally occurs quite early in life, and thus the patient remains small and stunted, and never arrives at full development. In some interesting cases the condition starts late in life, and then, as in one of my cases, the patient may become smaller and of poorer physique after he has developed along normal lines. This lack of growth is even, so that the proportions of the different parts of the skeleton remain more or less normal, and hence the condition is easily distinguishable from achondroplasia. Several observers, however, have noticed changes in the pituitary in association with achondroplasia. With the lack of growth there is a failure to develop the secondary sexual characteristics, so that the patients appear to be younger than they really are, and at the age of 35 or 40 may seem to be only 14 years of age. The bones are small and relatively fragile, and the muscular attachments are poorly developed. The junction at the epiphysis is greatly delayed, but the formation of the bones is regular, and there is no enlargement of the epiphyseal ends, as may be seen with achondroplasia. The skull is small with thin bones, and a skiagram may show very definite changes in the pituitary fossa, which varies with the nature of the lesion. If, as is not uncommon, there is a simple cyst, the fossa may be much dilated and the clinoid processes may be absorbed. The lower jaw is badly developed and there is a poor eruption of the teeth. The muscles are ill developed and are feminine in character. The skin is also soft, delicate, and white. The body and face remain hairless, and the voice is thin, high, and piping, so that the patient, if a male, retains many of the female characteristics. The intelligence is generally below normal. The appetite is poor, and there may be alterations in the secretion of urine, there being generally polyuria. Glycosuria is not present and as a rule the sugar tolerance seems to be increased. Later, local pressure symptoms, and especially those upon the optic chiasma and nerves, will become evident. Headache and other signs of general pressure will appear as late manifestations.

If the symptoms appear soon after puberty, as in the sixth case of my series, these changes of general atrophy will appear after the patient has reached a normal height, and after operation they will gradually disappear. This progress throws a certain amount of doubt upon the belief that the symptoms are due to a simple hyposecretion of the anterior lobe, for in my own case there was an enormous improvement after the whole of the pituitary had been removed, and the patient is now rapidly passing again into a normal condition, and this in spite of the fact that he has taken no pituitary extract by mouth. Cases of atrophy occurring in late adult life have not been recorded, but the changes that are found in cases of fragilitas ossium would suggest that they might be due to a hyposecretion of the posterior lobe, and it will be of interest to note in the future whether such changes are recorded.

Posterior Lobe Increase.

There is some doubt as to the actual changes which occur with an increase of function of the posterior lobe. One would imagine that this would give rise to a greatly increased blood pressure, polyuria, and a generally active metabolism. Thus theoretically it would seem possible that some of the cases of chronic nephritis in early life would be due to such changes. On the other hand, certain cases have been reported of children who have rapidly developed, and at the age of 8 or 9 have shown an abnormal development both physically and sexually. Poynton reports a case, for instance, of a boy aged 8 who had a well-marked moustache, beard, and whiskers. He regarded the case as being due to a pituitary lesion and not to a suprarenal growth. Similar cases of precocious development, both psychically and physically, have been reported in association with pineal tumours. Such cases have been reported by Howell, Ogle, Frankl-Hochwart, Heubner, Gutzeit, Marburg, Oestreich and Slawyk. Marburg believes, however, that in the case of a pineal tumour they are due to hyposecretion, while with a lesion of the pituitary there is a hypersecretion of the posterior lobe.

Dystrophia Adiposo Genitalis (Fröhlich's Disease).

It is of interest to note that many of the cases of this condition have shown the presence of a cyst in the pituitary gland. My own cases are of special interest from this point of view, for the patient who showed Lorain's disease had a large semi-calcareous cyst, which in the *x*-ray photograph was well forward and showed destruction of the anterior clinoid processes; whereas the girl who had typical Fröhlich's symptoms had also a calcareous tumour, which was shown by the skiagram to be far back and had led to a destruction of the posterior clinoid processes. The changes in the body are remarkably characteristic. There is an enormous overgrowth of the subcutaneous fat, the deposit of which is more or less general, but has a tendency to be placed so as to exaggerate the female outline of figure. Thus, in a male, there is a relatively greater thickening of the buttocks and thighs and a subcutaneous deposit in the breasts. With this increase of fat there is a low blood pressure and a good or increased tolerance to carbohydrates. Sometimes there are other changes, which are possibly due to an associated diminution of the anterior lobe secretion, so that they may be small in size with late union of the epiphyses, softness of the skin, and no growth of hair. There is always a diminution in the sexual development. The genitalia remain small and the voice is high-pitched and squeaky and the thyroid small. It is probable that what Fearnsides has described as the "pudding-face type" is a mild degree of the same disease. There may be a slight general increase in the subcutaneous fat—the face is fat and rounded with red prominent cheeks, and the voice is high and piping. The thyroid is small and amenorrhoea is generally present. As in the Fröhlich's type there are frequently alterations in the visual fields which may, if left, progress to complete blindness.

Adiposis Dolorosa.

There is an increasing amount of evidence that a large number of the cases which have been described as adiposis dolorosa are in reality examples of hypopituitarism which have developed after adult life; they therefore bear the same relationship to Fröhlich's disease as acromegaly does to gigantism. Cushing quotes several cases in which lesions of the pituitary have been found under such circumstances, and Dercum himself has included certain mental changes as one of his four cardinal symptoms of the disease.

The disease is generally seen after middle age, and is more common in women. It is characterized by a rapid increase in weight, which is due to large irregular and frequently painful deposits of fat. The deposits may be diffuse in outline or may be more or less localized, so that they form large irregular lipomata. The deposition of the fat is very characteristic. It is almost wholly localized to the trunk and pelvis, while the face, neck, and extremities are as a rule free. The hands are not enlarged and the fingers are usually tapering. Sometimes the portions of the body above the waist will remain entirely free while the buttocks and thighs are enormously enlarged. In other cases there is also a big deposit in the back and shoulders, and sometimes even in the posterior aspects of the arms. There is frequently with this an increase in the sugar tolerance, and not uncommonly some local evidence of pressure, as shown by changes in vision. Occasionally there are well-marked evidences of general pressure, as shown by headache and drowsiness, and very frequently there is amenorrhoea.

Local Pressure Symptoms.

The most frequent change which occurs with the local pressure of the growth is an affection of vision. The pituitary gland, with so close a relationship to the optic tracts, chiasma, and nerves, is liable as it enlarges to press upon these

structures and give rise to changes in vision. Little will be said about these changes, as they will be described in detail by other contributors. It is sufficient to say that the most characteristic change is due to pressure upon the inner part of the optic tracts and the inner part of the chiasma, so that the fibres passing in the two nasal fields of the retina are those which are chiefly affected. In these circumstances patients will develop a bitemporal hemianopsia, and it will often be noted that they complain that they are unable to see objects on one side of them, and that they appear to be looking through opera glasses or through tubes. It must be remembered, however, that with some of the larger tumours of the gland the whole chiasma is pushed upwards and backwards. In these circumstances the pressure is more even, and the fibres running to the nasal fields will not be so much affected. As, however, the chiasma is drawn upwards the tumour will compress the two optic nerves in that portion of the circle of Willis which is formed by the two anterior cerebral and the anterior communicating arteries. There will thus be a constriction of both optic nerves, which explains why in some cases the patient will develop a complete optic neuritis or atrophy giving a general impairment or even complete loss of vision.

Much less frequently there is evidence of interference with the changes of the fifth nerve; the patient may then suffer from severe attacks of neuralgic pain on one or other side of the face, and there may be an area of hyperaesthesia limited to one or all of the divisions of the fifth nerve. In my own experience there has only been one case of diplopia and no example of any interference with the first, fourth, or sixth nerve. Cushing, however, states that in several of his cases there have been periods of double vision suggesting oculomotor implication, and in advanced cases an anosmia may be complete. These local pressure symptoms may or may not be associated with changes in the general metabolism.

General Pressure Symptoms.

The pituitary tumour, like all other intracranial tumours, will sooner or later give rise to evidences of a generally increased pressure, but it must be remembered that headache alone is not of necessity such an evidence. Severe local headache may be found quite apart from other signs of pressure, and may be due to pressure upon or erosion of the basisphenoid. On the other hand, tumours which are not entirely pituitary in origin may arise in the base of the brain and by pressure upon the pituitary may interfere with the functions of this gland and so give rise to changes in the metabolism. If the case be left for any length of time, evidences of general pressure, such as increased headache, mental dullness passing on to drowsiness, optic neuritis, and perhaps even slowing of the pulse, will be certain to appear. It must be remembered here also that although one of the strongest cases of evidence of a pituitary lesion is that presented by the *x*-ray appearances, a general intracranial pressure from some remote cause, or even a hydrocephalus, may give rise to a considerable enlargement of the pituitary fossa, and hence the condition may be mistaken for a primary tumour of the gland.

Indications for Operative Treatment.

It has been pointed out that cases both of hypersecretion and hyposecretion are generally due to a tumour or cyst, and thus both would seem amenable to surgical treatment. The first essential is therefore to exclude the possibility of a case of hypopituitarism being due to a primary atrophy of the gland. In such a case there would, of course, be no evidence of local pressure and an *x*-ray photograph would show a small fossa. These cases are not operated upon, for in the light of our present knowledge it would seem that removal of the gland would only increase the hypopituitarism. This opinion may later have to be altered, for it is interesting to note that two of my cases, one of which was an acromegaly, had the gland completely removed, and have not developed hypopituitarism; whereas another, who had Lorain's disease and also had the tumour and pituitary gland completely removed, has lost his symptoms of hypopituitarism although no gland extract has been administered. There is, however, another question which has to be considered, and that is a comparison of the dangers of operative treatment as compared with the danger of the disease. Some forms of acromegaly are very slowly progressive and may, in fact, after a certain period of time become stationary, so that the patient may live in comfort for many years. On the other hand, the operation must always be considered as a serious one and at present has a relatively high mortality. For this reason the majority of physicians and surgeons would not advocate operative interference for simple hypo- or hyper-pituitarism. When future experience has reduced the mortality of surgical treatment it will probably be applied more frequently in this type of case. At present the indications for operation are:

1. The presence of some enlargement of the gland either from a tumour or cyst.
2. A rapid increase in the symptoms.
3. The presence of local pressure symptoms, especially diminution in the field of vision.
4. The presence of general pressure symptoms, such as headache, vomiting, or early optic neuritis.
5. The presence of glycosuria.

In regard to the presence of glycosuria it must be remembered that this is directly due to the lesion of the pituitary, and that very frequently by careful medical treatment and diet it may be eliminated, and if the operation be then performed it will not return, although medical treatment is not continued.

Choice of Operation.

I do not propose to consider in detail the different methods of operative technique, for in my own experience one path of approach is so greatly superior to all others that it alone need be considered. At the present time the operation which is most frequently performed is the intranasal method of transsphenoidal approach, but to my mind any form of approach through the sphenoid bone is incomplete and unsatisfactory. The opening is bound to be small and may give no idea of the size or position of the tumour. If there be a cyst it may be drained, but there is no evidence that it will not refill. A solid tumour can at best be scraped out piecemeal and therefore may recur. This method of approach must also, even if carefully performed by the submucous route, be associated with a certain danger of sepsis. All these objections are absent when performing the operation by the transfrontal route. A perfect view may be obtained of the pituitary gland and its surrounding structures, the whole tumour can be carefully dissected free under direct vision, and a mass as large as or larger than a walnut can be taken away as a whole. Two objections are made to this route. The first is that it carries with it too high a primary mortality. In the past this has been so, but it is very largely due to the fact that operation has been delayed until the patient has developed increased intracranial pressure. In such circumstances any cranial operation is bound to carry with it a high mortality. If the operation is carried out before the onset of this complication there is no reason why there should be any mortality at all. Of my six cases where this operation has been performed two died as an immediate result, and both of these at the time had an increased intracranial pressure. Even with this intracranial pressure the transfrontal route shows a mortality no greater than that by the extracranial route, for Frazier has collected sixty-four tumours operated upon by the extracranial method with twenty-four deaths.

The other objection which has been raised to this method is that good access cannot be obtained to the floor of the pituitary fossa, and it is therefore usually stated that if the *x* rays reveal a deep erosion of the fossa the transsphenoidal route should be applied; whereas, if the *x* rays indicate an upward growth, the intracranial route is the one of choice. I believe that this suggestion is quite erroneous. In every case where I have operated by the transfrontal route I have been able to obtain access to the floor of the fossa, and by elevating the brain a good view of the dural floor has been obtained. The method which I advocate is a modification of the operation published by Frazier, which itself was a modification of the technique of the methods used by Krause and McArthur. The actual steps are as follows:

The approach is always carried out on the side of which the vision is most affected, for it may happen that the operative steps may cause a certain amount of trauma of the optic nerve, and if the eye is already blind on this side no harm will be caused.

A rectangular incision is made. It commences in the temporal region just above the zygoma and passes along the line of the eyebrow to the middle of the forehead. From here a second limb passes vertically upwards for a distance of about four inches, and from this upper extremity a third incision is made parallel to and of the same length as the first. The soft tissues are then elevated from the four corners of the flap marked out, and openings are made with

a trephine at these corners. The discs of bone so removed are placed under the portions of the scalp around the flap and so kept until the termination of the operation. The four trephine openings are now united with a Gigli's saw, the cuts being made obliquely upwards and outwards so that the bony flap is larger externally than internally. The whole flap is now elevated and turned outwards. The dura is gently raised from the roof of the orbit until the posterior edge of the lesser wing of the sphenoid is exposed. By this means the greater part of the retraction of the brain is performed with the dura still intact and is thus preserved from harm. When the lesser wing is exposed the dura is opened and very little further retraction will expose the olfactory tract, the optic nerve, chiasma, and the pituitary tumour. Gentle dissection with a Watson Cheyne dissector will usually determine the size and motility of the tumour, and as a general rule this can be elevated from the pituitary fossa and entirely freed and removed. Haemorrhage is not excessive and in no case have I found it necessary to ligature any vessels. If a cyst be present it may be necessary to aspirate it before dissecting out the cyst wall. The tumour having been removed the brain and dura are allowed to drop back into place, the dura is sutured, the bone flap replaced, the four trephine circles are removed from beneath the scalp and put back into place, and the soft tissues are sutured. The operation differs from that of Frazier in that the supra-orbital ridge is untouched, and it is found that by elevating the dura sufficient retraction is obtained to give a perfect view of the pituitary fossa. The trephine circles of bone are replaced at the end of the operation, for if this is not carried out an unsightly depression may persist in the forehead immediately above the root of the nose.

RESULTS OF OPERATION.

My experience includes the following cases:

CASE I.

I. J., female, aged 14, was brought to me on June 14th, 1915, with a history of having had headache for two years, fits for eighteen months, and blindness for seven weeks. She was extremely fat; there were no secondary sexual characteristics.

Operation.—Right frontal approach; orbital ridge divided; cyst with cholesterin fluid drained.

Result.—Little improvement only. The fits returned, and she died in ten months.

CASE II.

S. B., female, aged 55; seen on October 23rd, 1915. She suffered from severe headache, had bitemporal hemianopsia, occasional diplopia, and later left blindness.

Operation.—Frontal flap; left optic nerve divided; tumour and pituitary removed entirely. The pathologist's report stated the tumour to be a solid acinous carcinoma of the pituitary.

Result.—Six years later the patient was doing well. She regards herself as a marvellous recovery, and is able to do all her work. Vision in right eye good.

CASE III.

M. S., female, aged 50; first seen July 17th, 1916. Symptoms: Headache, vomiting, vertigo, drowsiness, increase of fat; she had bitemporal hemianopsia.

Operation.—Left frontal flap; pituitary and tumour easily removed. Pathologist's report: Excess of acinous tissue containing secretion; probable adenoma.

Result.—Collapse followed the operation, and the patient died the next day.

CASE IV.

S. S., female, aged 42, came to me on January 12th, 1918, with a history of having had changes of vision for seven years; she had bitemporal hemianopsia passing on to blindness, and suffered from vomiting and headache.

Operation.—Right frontal flap; tumour removed, apparently completely. The pathologist's report stated that the tumour was a cuboidal-celled carcinoma.

Results.—The patient collapsed the same evening and died. The *post-mortem* examination revealed the fact that removal of the tumour was incomplete.

CASE V.

J. S., female, aged 42; seen February 12th, 1921. History of typical acromegaly for seven years, bitemporal hemianopsia, and glycosuria (relieved by medical treatment).

Operation.—Left frontal flap; tumour (a small sphenoidal-celled carcinoma) removed entirely from under chiasma.

Result.—April 28th, 1922: Complete cure; vision nearly perfect; symptoms of acromegaly diminished; no glycosuria; still slight headache.

CASE VI.—*Acquired Lorain.*

E. P., male, aged 23; first seen October 28th, 1921. Symptoms: Headache, vomiting, loss of appetite, weakness, muscular atrophy; loss of secondary sexual characteristics; bitemporal hemianopsia.

Operation.—Right frontal flap; calcareous tumour (adenoma) removed from beneath chiasma.

Result.—June 5th, 1922: Complete cure. The patient has gained 3 st., and is regaining secondary sexual characteristics. Vision greatly improved; still has temporal hemianopsia.

BIBLIOGRAPHY.

Bell, W. Blair: *The Pituitary*, London, 1919.

Cope, v. Zachary: The Pituitary Fossa and the Methods of Surgical Approach Thereto, *Brit. Journ. of Surg.*, vol. iv, 1916–17, p. 107.

Cushing, Harvey: *The Pituitary Body and its Disorders*, 1912.

Duffy, W. C.: Hypophyseal Duct Tumours, *Annals of Surg.*, November and December, 1920, pp. 537 and 725.

Erdheim: *Beitr. z. Path. Anat. u. z. allg. Path.*, 1909, 233.

Fearnsides, E. G.: Diseases of the Pituitary Gland and their Effect on the Shape of the Sella Turcica, *Lancet*, July 4th, 1914.

Frazier, C. H.: An Approach to the Hypophysis through the Anterior Cranial Fossa, *Annals of Surg.*, vol. lvii, February, 1913, p. 145.

Frazier, C. H.: Lesions of the Hypophysis from the Viewpoint of the Surgeon, *Surg., Gyn., and Obstet.*, December, 1913, p. 724.

Gibson, W. S.: The Topography of the Hypophysis Cerebri, *Surg., Gyn., and Obstet.*, August, 1912, p. 199.

Goetsch, E.: *Bull. Johns Hopkins Hosp.*, 1916, xxvii, p. 129.

Gutzeit: Inaugural Dissertation, Königsberg, 1896.

Handelsmann, Dr., and Horsley, Sir V.: Preliminary Note on Experimental Investigations on the Pituitary Body, BRITISH MEDICAL JOURNAL, November 4th, 1911, p. 1150.

Heubner, O.: *Verhandl. d. Gesellsch. deut. Natur. f. u. Aerzte* (1898), Leipzig, 1899, lxx, part 2, 2 Halfte, p. 220.

Hirsch: *Berl. klin. Woch.*, 1911, ii, p. 1933; *Arch. f. Laryn. u. Rhinol.*, 1912, xxxvi, p. 529.

Howell, W. H.: *Journ. Exper. Med.*, 1898, iii, 245.

Howell, C. M. Hinds: Tumours of the Pineal Body, *Proc. Roy. Soc. Med.*, Neurological Section, March, 1910.

Magnus, R., and Schafer, E. A.: *Journ. Physiol.*, 1901–2, xxvii, p. 9.

Marburg, O.: *Deut. Zeit. f. Nervenheilk.*, 1908, xxxvi, p. 114; *Wien. med. Woch.*, 1907, lvii, p. 2512.

Ogle, C.: *Trans. Path. Soc. London*, 1859, i, p. 4.

Oestreich and Slawyk: *Virchow's Archiv f. Path. Anat.*, clvii, p. 475.

Poynton, F. J.: Demonstration of Cases of the Pituitary Body, *Proc. Roy. Soc. Med.*, Section of Neurology and Ophthal., May, 1913, p. 18.

Schafer, E. A., and Vincent, S.: *Journ. Physiol.*, 1899, xxv, p. 87.

Schafer, E. A., and Herring, P. T.: *Proc. Roy. Soc. Biol.*, 19 6, lxxvii, Ser. B, 571.

Sekiguchi, S.: Hypophysial Disorder in Mammary Cancer and its Relation to Diabetes Insipidus, *Annals of Surg.*, March, 1916, p. 297.

Von Eiselsberg: *Trans. Amer. Surg. Assoc.*, 1910; *Arch. f. klin. Chir.* c, 8 et seq.

Von Frankl-Hochwart, L.: *Deut. Zeit. f. Nervenheilk.*, Leipzig, 1909, xxxvii, p. 455.

MENTAL SYMPTOMS IN PHYSICAL DISEASE.

BEING AN ABRIDGEMENT OF THE BRADSHAW LECTURE DELIVERED BEFORE THE ROYAL COLLEGE OF PHYSICIANS OF LONDON,

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THE close relationship of mind and body has long been recognized, but in practice has been largely lost sight of, and the tendency has been to investigate them apart, to the detriment of our knowledge of each. It shows how dominated we are by tradition when we realize that it is customary for a student to pass through his medical instruction in the wards of a hospital with little or no thought given to the mental aspect of the patients he has been observing. It is true that he will hear something of hysterical manifestations, but this narrowed view is misleading, for it is apt to convey to the student that hysteria is the beginning and end of functional nerve disturbance. It is encouraging to learn that the term "mental" is now being generally used when reference is made to normal mind. This has a dual value: it brings the study of normal and abnormal mental states into closer relation, and it emphasizes the fact that both the healthy and the ill man have a mental outlook which should be investigated.

It must be conceded that all physical disease must have a concomitant mental change, just as all mind disorder is associated with variations in the bodily functions. The close interrelation of all the various systems of the body is increasingly emphasized by physiologists, pathologists, and clinicians, and the work done during recent years upon the vegetative nervous system calls for further careful investigation. There is always the danger that the pure clinician will seize upon an explanation which seems to fit in with any syndrome of symptoms with which he is confronted, and the physiologist working in his laboratory is apt to overlook a clinical picture which he never has the opportunity of seeing. Fortunately this is all changing, and in the future we shall see clinical physicians and pure scientists working in much closer relationship.

It is important to try to discover some fundamental principles as to how and why mental symptoms develop in association with physical disease. Since sensation is the most elementary of all conscious processes, and since it is largely upon sensation that we form a knowledge of self, alteration in sensation from whatever cause must give rise to mental symptoms. Sudden and extensive variation in sensation

will give rise to more marked mental changes, but any subacute and persistent alteration will be definitely reflected in the mental outlook of the individual. Every organ, and indeed every structure of the body, must be represented in the field of consciousness, but the stimuli arising from them only arouse consciousness of their existence when they are raised above a normal intensity. On the other hand, it is possible to obtain a relative hyperaesthesia by the lowering of sensitivity in the surrounding tissues. Pain—one of the most common changes in sensation—has been regarded from the philosophic standpoint as something of value to the organism and as tending to favour its survival. But pain is not always related, either by its cause or by its persistency, with some definite abnormality of which it is a more or less precise indication of constant value. Pain tends to persist long after the original cause has ceased to operate, and the longer it exists the more difficult it is to relieve. Pain evokes the same physical changes that are aroused by emotion, and the energy that must be dissipated by the mobilizing of these forces must sooner or later lead to exhaustion, which in some persons is more noticeable on the physical side, and in others in changes in the mental attitude.

Apart from severe pain there is no symptom so capable of initiating bad mental habits as discomfort. Tics are all good examples of this, but some of them lead to permanent ill health unless understood and suitably relieved; aerophagy is an instance. During the last decade, and more especially owing to the work of Dejerine, emotion has come to be regarded as one of the most important factors in the mental and physical health of an individual. It may arise from an external or an internal cause. By its suddenness or by its intensity emotion may completely overthrow the equilibrium of the subject who experiences it. This condition may on rare occasions be lasting, though it is more common to have a gradual return to normal self, but this regaining of conscious judgement is by no means even, and is often interrupted by a series of relapses. Even a lesser emotion if it lasts may set up a very definite "preoccupation" which in turn may lead to some mental change.

Every person has his own way of reacting to emotional excitation, and in some instances an external emotional stimulus, such as the shock of hearing bad news, only develops its full potency after being reinforced by internal emotion. A common form in which this type is to be observed in relation to physical disease is when a patient has been told some disquieting news regarding his health or when he may have inferred from some gesture or expression of his medical adviser that his condition is serious. Whether the emotion is severe or slight, if it occasions loss of intellectual control it tends to the establishing of a neurasthenic state, which in turn leads to a lessening of the power of adaptation in the person so affected. In some cases the neurasthenic condition may be complex, but in others it may be limited to the disorder of function of some organ of the body. To this type belong those individuals who develop fears regarding their heart, their lungs, or indeed any organ of the body, and this condition may persist long after the original emotional cause has disappeared and the patient has regained full intellectual control. The ill person is very suggestible, especially towards a morbid outlook, and any remark made by a physician may be so exaggerated and distorted as to lead to a preoccupation of an important kind.

Again, the number of persons who break down either immediately after an operation or some weeks later is larger than some may suppose, and many of these can be traced back to the emotional shock that the individual received when he was told that an operation was necessary. Emotional shock leads to preoccupation, and preoccupation leads to sleeplessness with its resultant nervous and mental fatigue. Highly hypersensitive persons should not be told of the need of an operation long before this is to be performed, and after any discussion of this nature has taken place the sleep of the patient should be carefully watched and sedatives administered if necessary. Also with this class of case violent purging a few hours before the operation should be avoided if possible, as this increases the danger of a nervous collapse with mental confusion after the operation. Crile and Lower conclude that surgical shock is a state of exhaustion which leads to changes in the brain cells, the liver, and the adrenals. They recognize that there is no distinction between emotional shock and shock produced by other means; the clinical phenomena are practically the same; they state that the cellular changes are apparently identical, and that the condition is brought about by an intracellular acidosis.

Many women, especially those in ill health or from some cause in a fatigued state—whether this is from the disturbed sleep so common in the later months of pregnancy or from some stress—are in a highly unstable state by the time that labour begins. The emotion which is always more or less present at this stage may pass the normal limits either from dread of the ordeal which confronts the patient or from the actual suffering at the time the baby is born. Such women should be protected by taking care that the hours of suffering and the intensity of it are limited, and yet too often these precautions are ignored, largely on the false argument that the process is a purely physiological one. An emotional disturbance of this kind may lead to years of ill health even if the patient escapes a severe mental breakdown. Emotion that has once been aroused may not settle down, and it nearly always leaves the person more susceptible to other emotional shocks.

Both physicians and surgeons know how devastating is fear, and how some patients who face an operation or an illness under this influence die without any apparent reason. To remove such fear, if it is possible -and it often is possible —is as urgent as it would be to control persistent vomiting, and yet in practice it is common to see the panic being accepted by the medical attendant in a fatalistic way and evoking nothing more than a regret that his patient is so foolishly nervous. The fearful person can usually be reassured, but he who would undertake to do this will best succeed if he has some knowledge of mind and its working. Some medical men, under the idea that they are bracing up their patient, do infinite harm by their remarks, especially if these include words of reproof. It is true that one fear may for the moment replace another fear, but I need hardly say that this is highly unscientific and is no more a remedy than is a lavish expenditure of sympathy. Fear and anxiety bring about a condition of mono-ideation in which the patient is unable to turn his attention away from the morbid thought which seems to fill his whole mind. If the preoccupation continues, it will begin to interfere with sleep, and Crile found that sleep was the only certain means of restoring the exhausted cells in the brain or liver and adrenals.

As a profession we have become unduly apprehensive of giving hypnotics. Experience has taught me how dangerous is this outlook, for insufficient sleep, especially under certain conditions, is infinitely more damaging than any drug; and as for the danger of inducing a habit by giving a hypnotic, if we omit the morphine and opium group, which should not be given, the risk is infinitesimally small. The physician who puts off prescribing a hypnotic as long as possible is the man who may bring about the habit he so much dreads, for he has by his methods permitted the patient to become obsessed by fear that he will not sleep, and when at last a drug is given and sleep is obtained the patient is terrified by the experience he has passed through of ever again having a sleepless night. Insomnia that is quickly relieved leaves no such memories, neither does it make the patient rely upon any artificial aid.

My experience strongly favours the view that a psychoneurosis may develop into a psychosis; but for the moment the point is that any mental symptoms arising in association with physical disease should receive the consideration that their presence merits. As in other matters of life the proposition is divided into two portions: the facts, or, as it is in medicine, the definite symptoms, and the inference or deductions that we make regarding those facts or symptoms. Now the body in health occasions few if any conscious sensations, and in consequence when they do arise the patient is apt to place his own interpretation upon them, and unfortunately the explanation is too often wrong. Altered sensation may be so severe as to occasion a patient to construct a definite delusion regarding it, but it is more common for him to have some fear as a result. This in turn may set up an emotive state, and this psychic reinforcement, when it occurs, greatly enhances the importance and the severity of the condition. Head has pointed out the varied moods that may arise in conjunction with pain of the reflected visceral type and the superficial tenderness which accompanies it. He states that "although reflected visceral pain seems to be the one universal concomitant of these mental changes in cases of visceral disease amongst sane persons, other factors predispose to their appearance"; but in the cases upon which he based his investigations he rigidly excluded all those in which there was an heredity of insanity or epilepsy. In addition to altered moods Head found that under certain conditions some persons suffering from visceral disease

are liable to develop hallucinations of sight, of hearing, and of smell. He further found in those persons who had visual hallucinations that superficial tenderness of the visceral reflected type was present over the forehead in every one of the cases, whereas in those who exhibited auditory hallucinations the tenderness was present in the vertical and parietal regions. The importance of the condition is not so much the sensory disturbance as the emotion that such a phenomenon may set up in the patient. It does not require a great imagination to appreciate what a disturbing effect these sudden hallucinations may have upon a highly sensitive person, and it is no cause for surprise that the inference that many of them draw is that their mind may be going. As they are sane persons their fear may be quickly allayed when the true nature of the disturbance is explained to them; but the tragedy of the situation is that, owing to the neglect of a systematic investigation of the mental aspect of a case by the general physician, the latter is often not conversant with the phenomena we are describing, and either he is unable to reassure his patient or, what is worse, he conveys to him the doubts that he has in his own mind. Many of these hallucinations are hypnagogic and occur when the patient is in a half-asleep and half-awake state. On the auditory side the sensory disturbances may take the form of tapping, knocking, bells, musical notes, name called, and even at times a few words. It is advisable in these cases to give one small dose of bromide daily to lessen the nervous reflex irritability, and if there is any tendency to sleeplessness this should be promptly relieved by sedatives.

Head states that when visual hallucinations arise in visceral disease the object appears white, black, or grey, never coloured or even tinted. He found that almost every patient felt frightened with the first hallucination of vision, as is usual with the auditory, but that if they were frequently repeated self-control returned. This again must largely depend upon the reassurance that should be given by the medical attendant.

Visual hallucinations may be and are a prominent symptom often of diagnostic value in states of toxaemia; the hallucinations may be only a part of a general altered mental state, for, if the poison is active, the patient usually soon becomes very confused, and may even be delirious. Nevertheless it is important to differentiate these cases from other types of mental disorder, as the mental changes may be very evanescent and pass away quickly when the intoxication is relieved. In such cases the natural resistance may be lowered and the tendency of the patient may be to react by mental changes. It is very necessary to recognize the syndrome of symptoms which arise in these toxaemic conditions—as, for example, their presence may be the first indication of pus.

Mental disorder is not haphazard in character, and the better we understand the grouping of its symptoms the more accurate we shall become in the diagnosis and prognosis of any given case. We are only upon the threshold of understanding the effect of any foreign protein taken into the body, but both clinically and experimentally it is recognized that striking effects may follow quite insignificant doses. It must be borne in mind that the effect may be more physical than mental, or vice versa, and consequently there must be every gradation between the two, and though the bodily symptoms may be the more common it is none the less important to seek for and to note any functional nervous change. Any poison is capable of producing mental disorder provided the person who takes it, by his special idiosyncrasy, reacts to it. The danger of regarding physical and mental disease in separate categories according to which group of symptoms is the more in evidence must be avoided.

Too little heed is given to gesture, expression, and posture. There are well-recognized diseases in which characteristic changes in any one or more of these are noted, and they may constitute important links in the syndrome of symptoms which go to establish the diagnosis of such diseases, but, generally speaking, little or no remark is made about them. Yet gesture language will convey as much as, if not more than, words, for these may be misleading, while gesture seldom is, for the latter is complex and it is the outward and visible sign of inward sensation and emotion. Maudsley, in his book on *Pathology of Mind*, says: "What is mind-reading but muscle-reading through movements so fine as to be discernible only to a practised sensibility?" Physicians of long experience acquire it, but it is a matter of too much importance to be left for time to teach and the observation of the student should be trained to appreciate it. He learns that physical pain, especially of the visceral type, is shown by the lower part of the face, but the tremor set up by strong and intermittent nerve currents transmitted to the various muscles may be of almost equal importance. The man who can observe can inquire, but he who sees but does not perceive is left in ignorance unless the information is disclosed to him by the patient. Further, even if noted, evidence of emotion, such as tremor and the like, is commonly explained away without any real investigation being made as to whether it should be regarded as a matter of consequence. Persistent disorder of conduct usually leads to further inquiry unless it is decided that it is purely hysterical, but owing to the loose way in which this term is frequently used abnormal behaviour may be wrongly regarded. The conduct may become undisciplined, and with this there may be a general restlessness; this is common in some forms of heart disease, and even more so in exophthalmic goitre. These may be the first symptoms to attract attention, and in any case they should never be looked upon as unimportant. Conduct may be disordered either by overactivity or by underactivity; great muscular response may take place with slight stimuli, or the inertness may be such that even with powerful stimulation the response is small, while between these two extremes stand infinite variations. A change of conduct which originates in the course of some disease may persist after the latter has passed away unless steps are taken to remedy it, for such a change may become a pure habit. If, on the other hand, the attention of the patient is drawn to the symptom and it is treated as part of the illness, it not uncommonly disappears as recovery takes place.

Disorders of the endocrine system are examples of the close relationship of mind and body. The disturbance may begin either from the psychical or from the physical side. The stimulation of the sympathetic nervous system and of its coadjutors, the adrenals and the thyroid, results in a mobilizing and rapid expenditure of reserves, and for the time a heightening of all the vital processes. It is a katabolic action, and yet, owing to the quickening of metabolism, it is at first associated with a feeling of well-being which may be so strong as to produce a mildly exalted state. But, should this continue, exhaustion, with all its usual mental and physical concomitants, must sooner or later result. Apart from emotion the feeling tones associated with disease are important to note and understand, otherwise the effective changes in the patient may be seriously misleading. One of the most remarkable and yet most common instances is the buoyancy of spirits to be observed in certain patients on the days immediately following an operation. Although this brightness may to a small extent be due to the relief of mind that the ordeal which has been weighing heavily on the patient is now successfully past, another cause, if certain authorities are correct, would seem to lie in the stimulation of the sympathetic nervous system and the endocrine glands, one of whose functions, it is said, is to protect the organism in time of stress. Too often one sees this cheerfulness misinterpreted, and the physician or surgeon who looks for a rapid result welcomes this attitude as an indication of returning health, and all too frequently it encourages him to abandon the rules of carefulness and to permit his patient to do things which hasten the onset and increase the severity of the exhaustion which must follow. If a patient is depressed or unduly elated, an endeavour should be made to discover the cause; I do not refer to states of melancholia and mania, which are usually spoken of as insane conditions. There are many variations in affective tone; some may be temperamental and some rhythmic, but others may be due to metabolism changes. I have long remarked upon the sense of well-being which is so commonly associated with a fall in the body weight; it is probably one of the most deceptive mental attitudes in life. During the war many of the civilian population who lost considerable body weight owing to the restriction of food commented on how much better they were for it; some, no doubt, were better because their reserves were abundant, but others learnt to their sorrow that this betterness was ephemeral and that a period of ill health awaited them.

The mental reaction of every person to disease is individual; it is always the same for that person, and is not haphazard, but follows rules and progresses in an orderly way. The more elemental the mind the easier the problem becomes, and for this reason to study the mental reactions of children to disease is the most helpful method of approach, for in later life the experiences that an adult has passed through add their colouring to the fundamentals. The tendency, or indeed

I might say the universal custom, has been to regard man as he appears; we have a face-value standard of mental and physical health, but we never rely upon the latter in the same way as we are prepared to accept the former. If the bodily health together with the functions of such organs as we consider to be important are satisfactory, the patient is regarded as an A man, notwithstanding that the mental outlook may be scarred with former illness. There is no better example of the danger of specializing than the study of mental and physical medicine. Theories become practice, and man has been viewed from these two standpoints, which at some periods have been so divorced as to have little or nothing to do with each other. The physiologist and the biochemist have been slowly linking these divorced subjects together, and it is the duty now of all clinicians to widen their vision and not only to make use of the beginnings that have already been made, but to add to their knowledge by a systematic investigation of mind states in all physical disease. We shall find that mental symptoms have their value, and that, whilst some are primarily hurtful, others may be largely, if not entirely, protective to the organism, and may form part of its armament in its struggle to survive. But, as with all functional disturbance, they may remain long after their purpose has ceased to exist. Habit is the state towards which everything is working, and it is one of the duties of the physician to see that baneful influences do not persist if it is possible to correct them. The physical hygiene of the future must include a knowledge of mental hygiene, just as mental hygiene must take note of the welfare of the body. From this several advantages will accrue: mental processes will be better understood and mental changes will become matter of commonplace; fears of insanity will be replaced by an enlightened understanding, and the incidence of the graver forms of mental disorder will be lessened.

THE TREATMENT OF RODENT ULCER BY CHROMIC ACID SOLUTION.

BY

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WICK, CAITHNESS.

The medical man who practises in a district remote from large hospital centres is often faced with difficulties in the way of treatment not experienced by his more favourably placed colleagues. When, for example, the case is one requiring special treatment, as with *x* rays or radium, and the nearest hospital equipped with the necessary outfit is several hundred miles away, the problem becomes very real. To the working man the expense of the journey and the time lost from work mean a great deal, and, unless his life is at stake, he must simply do without the treatment and go on using such palliative measures as can be obtained locally.

Rodent ulcer is a disease of local malignancy which can be successfully treated by excision, by escharotics, or by radium. The two former involve the destruction of the healthy along with the diseased tissues, while the latter is not always available. Many patients object to operation, and in some cases the site of the ulcer renders operation difficult, if not impossible, without leaving a disfiguring scar. Excision of a rodent ulcer from the lower eyelid, for instance, may be followed by an ectropion more unsightly if less serious than the original ulcer.

The treatment of rodent ulcer by the application of chromic acid solution, 10 per cent. in distilled water, was suggested to me in 1910 by Sir George T. Beatson, senior consulting surgeon to the Royal Cancer Hospital, Glasgow. I began practice in Wick a few months later, and during the following four years treated 19 cases successfully. I intended publishing my results then, but five years of war intervened. Since 1919 I have treated 6 other cases, and am satisfied that the results justify this article. In only one case was the diagnosis confirmed histologically, but the history and appearance of the others made the diagnosis clinically certain. With two exceptions, all the cases were comparatively early—that is to say, ulceration had taken place, but the soft tissues only were invaded. In one the alae nasi and part of the septum were destroyed and the nasal bones exposed; after four months' treatment the raw surfaces were covered by healthy granulating tissue, except a small portion of the floor of the nose. Unfortunately this patient died of pneumonia before treatment could be completed. In the other case the ulcer was small and situated on the right ala nasi, penetrating to the cartilage, which formed its base. This case proved most intractable, and eleven months' treatment was required to effect a cure, but during that time the patient did not lose a single day off work, and now, twelve months later, a slightly dimpled scar is all that remains.

As all the cases were treated in the same manner I will describe one more before proceeding to the details of the treatment.

The patient, a man aged 70, consulted me in November, 1919, about an ulcer of six years' duration affecting the lower eyelid towards the inner canthus. In shape it was roughly elliptical and its upper border within a quarter of an inch of the margin of the lid. Removal of the crust which covered the floor of the ulcer was followed by purulent discharge. He had no pain, but a haunting fear that sooner or later his eye would become affected. After four and a half months' treatment the ulcer was healed. It had filled up and there was only a slight depression to indicate where it had been. The scar was supple, and hardly distinguishable from the surrounding skin. There was no contraction, and consequently no ectropion.

Treatment is carried out as follows: When the crust, if any, has been removed and the floor of the ulcer cleansed with plain sterile water, chromic acid solution is applied to it and to the surrounding skin by means of a fine camel-hair brush. This is repeated daily until the patient complains of pain coming on about an hour after treatment and usually lasting an hour. Each succeeding day the pain is of longer duration and signs of irritation appear. The surrounding skin becomes red and oedematous, and at this stage, varying from the fifth to the tenth day, the treatment should be discontinued and a bland ointment substituted till the pain and inflammation subside. Plain vaseline or equal parts of boric and zinc ointments may be used. It is immaterial what emollient is chosen so long as the active treatment is interrupted at intervals regulated by the degree of pain and irritation present. During the first few weeks the ulcer may actually increase in size and depth, and it is well to warn the patient of this before beginning treatment; otherwise he is apt to conclude that he is getting worse instead of better. In my earlier cases I found that repeated application of the chromic acid solution was not infrequently followed by the formation of a dense firmly adherent crust exceedingly painful to remove. To obviate this I now apply to the floor of the ulcer a pledget of cotton-wool which absorbs the exudate and is easily changed next day. When the extreme limit of malignant invasion of the surrounding skin has been reached further changes in the appearance of the ulcer take place. Its raised border becomes flattened and covered with healthy-looking epithelium which gradually advances along the floor of the ulcer towards the centre. The chromic acid applications are now attended by less pain, and eventually the ulcer appears to be completely healed. Should this occur during the use of the ointment chromic acid should again be applied for a few days, and if the disease has been eradicated no effect whatever will be produced. Should, however, the apparently healthy epithelium thinly cover tissue in which malignant elements are still present it will break down, and a continuation of the treatment will be necessary. Chromic acid diluted to 10 per cent. strength, while inimical to rodent ulcer cells, does not affect those of healthy tissue however tender.

On two occasions I have tried its effect on epithelioma of the lip. In one case the patient refused operation, and within a fortnight of the commencement of treatment the ulcer had doubled in size and, at the urgent request of the patient, was dealt with surgically. The other case was one of incipient epithelioma at the junction of the upper and lower lips with extensive leucoplakia of both lips. The chromic acid solution was employed with a view to getting rid of this before operation. It was eminently successful so far as the leucoplakia was concerned, but here again the epitheliomatous ulcer was stimulated to rapid growth and was shortly afterwards effectively removed by Mr. Henry Wade of Edinburgh.

I would like at this point to mention an instance not of rodent ulcer, but with the same tendency to local malignancy, successfully treated on similar lines.

The patient, a woman over 70 years of age, suffered from a papillomatous growth of the left cheek of several years' duration. She had been operated on six times, with a recurrence on each occasion at the end of three to seven months. On her refusal to submit to further surgical treatment she was sent in 1909 for radium treatment under the care of Dr. Dawson Turner[1] of Edinburgh. She was treated for 43.3 milligram hours, and left hospital apparently cured, but five months later there was a recurrence at three separate parts of the scar. I saw her a year later and after

three months' treatment with chromic acid the growth again disappeared. Nine years later she died, but there had been no recurrence.

This case illustrates the importance of a form of treatment easily accessible. Had the patient resided near the centre where radium treatment was carried out, instead of three hundred miles away, the recurrence could have been dealt with at once. As it was, she could not afford a second journey. It may be argued that in widely scattered districts, where the patient lives ten or twenty miles from his doctor, this treatment is almost as inaccessible as radium. I had one such case.

A man, aged 60, came to me complaining of an ulcer which he had noticed three years previously and which he had endeavoured to cure by many and varied ointments of the proprietary type—and his ulcer slowly increased in size. It was situated at the angle formed by the lobe of the right ear with the skin extending from it towards the angle of the jaw and measured about three-quarters of an inch in diameter. As he informed me that it was quite impossible for him to attend daily for treatment I gave him a prescription and wrote down in detail the procedure to be followed, asking him to report weekly for observation and further guidance. I did not see him again for two months, and by that time the ulcer had almost healed. Eighteen months later he dropped in casually to tell me that his ulcer had completely healed a month after I had last seen him and had not again broken down.

The duration of the treatment where the soft tissues only are affected averages three and a half months. Where bone and cartilage are invaded the patients should be strongly urged to go where more effective treatment can be obtained. At the present day no patient suffering from rodent ulcer should be allowed to reach that stage.

Of the various local remedies that have been used successfully in the treatment of rodent ulcer, and whose action, like that of 10 per cent. chromic acid solution, is selective, salicylic acid, pyrogallol, and arsenious acid may be mentioned. Of these, arsenious acid, according to Dr. Norman Walker[2] of Edinburgh, has given most satisfactory results. In his *Introduction to Dermatology* he discusses very fully the treatment of rodent ulcer, and, in describing the use of drugs whose action is caustic and selective, he rightly emphasizes the necessity for care in the choice of the drug as well as in its application. Of the effect of the arsenious acid preparation favoured by him he says: "In twenty-four hours the part has swollen up and the pain experienced is very severe, so severe that it is often necessary to give the patient morphine." Farther on he says, "In many cases one course of this treatment is successful." I admit that, in comparison, the course of treatment by 10 per cent. chromic acid solution is long and even tedious, but it is less drastic in its action, the onset of pain is more gradual and need never be permitted to become unbearable. Its advantages discount both the length of time taken to effect a cure and the slight pain and discomfort experienced during its exhibition. The remedy is cheap, and it is easy to use. The destruction of tissue following its use is limited to diseased elements. The patient is spared the expense of a long railway journey and is able to continue at work throughout the treatment. The resulting scar, wherever situated, is soft and pliable, and there is no contraction with consequent disfigurement. And finally, should recurrence take place, the patient has the satisfaction of knowing that a simple and effective remedy is immediately available.

REFERENCES.
[1] Dawson Turner, *Radium*, 1910, p. 53. [2] Norman Walker, *An Introduction to Dermatology*, seventh edition, p. 324.

PROPHYLACTIC RECTIFICATION AND VERSION AT THE ANTE-NATAL CLINIC.

BY
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Down to the close of 1921 the correction of malpositions (right occipito-posterior) and malpresentations (pelvic and transverse presentations) in the ante-natal department of the Edinburgh Royal Maternity Hospital had attained only a partial success. There were numerous cases, especially of malpositions (chiefly right occipito-posterior) in which neither one-handed nor two-handed palpation applied by the abdomen or the vagina or by both routes sufficed to bring the back of the foetus round to the anterior aspect of the mother. Postural plans were also experimented with—for instance, a modified Trendelenburg position was used in some cases in the hope that the presenting part would slip out of the pelvic brim and become movable above it; but success was only occasional. Dr. F. J. Browne and I often talked over the subject, but without devising anything which was wholly satisfactory.

On November 12th, 1921, Dr. R. C. Buist of Dundee published in the British Medical Journal (p. 782) "A note on the early recognition and corrective treatment of occipito-posterior positions," in which he described the method of rectification by means of towel pads. There were some details in the procedure which were not clear to me, so I got into communication with Dr. Buist, who was kind enough to explain and illustrate the method by diagrams. From the beginning of the present year (1922) the method by pads has been employed in the ante-natal department for the correction of occipito-posterior positions of the head. The results for the six months from April 1st to September 30th, 1922, have been most satisfactory. During this period 509 expectant mothers attended the ante-natal clinic as new cases. Amongst these there were 26 instances of right occipito-posterior position of the foetal head, and of these 24 were rectified by pads into anterior positions, whilst 2 remained posterior, notwithstanding the treatment. In most of the cases the rectification was into the right occipito-anterior position, but in some the rotation was continued until the head was found to lie in the left occipito-anterior position. In one case which has occurred since the end of September the original position was diagnosed as left occipito-posterior and pads were applied, the rolled one on the left side and the flat one on the right; on the following day it was found that the presentation was a breech, and external version was then performed, producing a right occipito-anterior position. This was the only occasion on which the application of the pads in posterior vertex positions was followed by the production of a pelvic presentation.

The method adopted was that recommended and described by Dr. Buist as follows:

"A binder is laid under the patient and two towel pads are prepared. The first is rolled to about the thickness of a forearm, the second is folded to a flat pad 6 or 7 inches square. The rolled pad is pinned to the binder in such a position that when the binder is firmly secured the pad will lie close in front of the anterior superior iliac spine behind and parallel to the trunk. The flat pad is pinned so as to lie on the limbs, pressing them backwards. It is sometimes useful to roll the patient to the side opposite the trunk and by hand bring the trunk as far as may be over to that side. The binder is then pulled firmly home."

In the Edinburgh clinic it has rarely been found necessary to take the patient into hospital for the rectification. The malposition is detected at the clinic; the patient is asked to return the next morning and to bring with her a binder, two towels, and safety pins; the pad and binder are then applied and the patient is allowed, after a short rest, to go to her home; she returns the next morning, when it is usually found that the position is anterior. Occasionally the pads have to be reapplied, rectification not having occurred at once. As has been said, the procedure only failed twice. Such failures are to be ascribed to the late date in pregnancy which has been reached, and the low level of the foetal head in the mother's pelvis. Very rarely was the posterior position reassumed after rectification.

It is difficult to find a completely satisfactory explanation for the corrective effect of the pads. Probably the rolled pad simply makes the existing position an uncomfortable one for the foetus; he will be mobilized, and, using the flat square pad to press his limbs against, will move into the position in which he is able to lie at rest, the right or the left anterior. I hardly believe it can be claimed that the rolled pad gets in behind the foetal back in the right occipito-posterior position and pushes it forward. The cases in which the position is found to be the left anterior are probably those in which the pads have produced a marked reaction by the foetus, and the back has thus been carried right across the abdomen. It is unnecessary to emphasize the great advantage this method of dealing with occipito-posterior positions possesses over the difficult and often uncertain plans of rectification applicable in labour; personal experience enables me to say with assurance that it is also much better than any method of manual replacement in pregnancy.

In the series of 509 pregnancy cases in the six months referred to 56 pelvic presentations were detected. In

11 of these cases no attempt at version was made as the pregnancy had only attained the sixth or seventh month, and it was thought that they might safely be left for a little longer. In 14 cephalic version was performed by external manipulation, sometimes by one and on other occasions by two operators. There were 7 cases in which version was found to be so difficult that chloroform had to be administered, with the result that success was obtained in 6. In 3 other cases attempts were abandoned owing to small amount of liquor amnii and close apposition of the uterus to the foetus. In 19 cases spontaneous version occurred. In 2 the patient did not return to the clinic. In this way the 56 cases were accounted for. There were 3 cases of transverse presentation in the 509 patients. Cephalic version was carried out in them all by external manipulation. Towel pads may be used in difficult breech and transverse presentations.

A CASE OF CONVERSION NEUROSIS.

BY

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WHILE doing the duties of staff surgeon in Ambala, India, I was called out early one morning to see a lady, aged 34, said to be acutely ill. On arrival I gathered that she had been having a series of fits which appeared superficially to resemble epileptic seizures.

When first I saw her she was just coming round from a second fit, and had gained a drowsy consciousness. She had incontinence of urine, rigid muscular contractions, and cyanosis. The temperature was 100° F., pulse full in volume. I learned that the day before, at about 11 a.m., she had gone into the bazaar wearing a very flimsy hat, and had come back with a severe headache which persisted throughout the day and night. A "touch of the sun" naturally suggested itself, particularly as that summer was an exceptionally hot one (about 108° F. early April, shade temperature at noon). I had the room darkened and cooled and a cold pack put to her head. The temperature and her general state did not seem to call for any other treatment. I eliminated malaria by film examinations. She had no more fits, and passed out of my care on departing to a hill station for the rest of the summer.

I was called again to see her in the following September. During her stay at the hill station she had had three severe attacks of a similar nature to the first, each more alarming than the one before, with longer periods of unconsciousness. The present was the fourth in five months. I found her on this occasion practically unconscious, the eyes turned upwards, the lips blue, the teeth still set (tongue not bitten as means to stop this had been employed). She had had a succession of four fits during the night, and was clearly feeling the strain. I admitted her immediately into the family hospital of which I had charge and asked the sisters to watch her closely and to note anything peculiar regarding the attacks. She was kept screened and quiet and put on a strong triple bromide mixture. She had three further fits, each one less severe than its predecessor, and under the influence of the bromides quieted down by the following day. The fits certainly appeared practically identical with those seen during an epileptic seizure. There was no family history of epilepsy or fits of any kind. Another blood film examination proved negative to malaria, and showed nothing abnormal in the differential count. Specific disease was excluded. I examined the central nervous system with extreme care. Nothing could be found beyond a slight increase in the knee-jerks.

Closer examination into her domestic life brought out the fact that her fits always corresponded with periods of worry about her two children during the absence of her husband on tour. The fits came on when he came back or just prior to his return—that is, when the tension of solitude was relieved. My patient passed rather a secluded life and saw very few people, although she lived well inside the cantonment.

Treatment.

The case here assumed a new aspect. I talked with her for a long while in private and led her towards the solution of her problem, which she eventually solved to her own satisfaction. She would never live again without a companion while her husband was away. This was the first step. Next came the consideration of drugs. Bromides I put immediately out of court in view of the fact that the case did not call for depression but healthy stimulation. I therefore put her on a series of injections (twelve in all) of the glycerophosphate compound put up in ampoules by Parke, Davis, and Co. During the full course her husband remained at home. The result was excellent. She felt inwardly much fitter—"never better for years," as she described it—and ceased to worry over her domestic problem.

Her husband went on tour shortly afterwards and returned to find her quite well. A companion stayed with her during his absence. Only once while he was away (she had again elected to live alone on three successive occasions) did she have any signs of recurrence. I was called in and found that she had been alone for nearly two weeks at a time when the political situation was causing us all some anxiety out here. She had three slight fits, not to be compared in severity with those seen previous to treatment. Again she settled down quickly and has not had any trouble since. I have now lost sight of her.

In a space of about nine months after the above treatment she had only one slight recurrence under great mental provocation.

This case I think is rather exceptional, (*a*) in virtue of the fact that the weakness caused through exposure to the sun should become by "conversion" the expression of a psychoneurosis and continue as such; (*b*) the vast improvement in the case after a strong tonic, backed up by the patient's own solution of her problem; (*c*) the complete lack of previous or family history pointing to any disorders of this nature.

NINETIETH ANNUAL MEETING

OF THE

British Medical Association.

Held at Glasgow, July, 1922.

PROCEEDINGS OF SECTIONS.

SECTION OF DISEASES OF CHILDREN.

Sir HERBERT F. WATERHOUSE, M.D., F.R.C.S., President.

DISCUSSION ON THE ETIOLOGY OF RICKETS.*

OPENING PAPERS.

I.—LEONARD FINDLAY, M.D., D.Sc.,

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IT is an interesting coincidence that on the return of the British Medical Association to Glasgow after a lapse of thirty-four years rickets should again form the subject of discussion by the Section devoted to the study of diseases of children. One appreciates the appropriateness of the choice, since rickets is a disease specially prevalent under industrial conditions, and probably no city in the kingdom possesses these in a more marked degree than does Glasgow. For this very reason the disease has naturally always interested Glasgow's students of medicine. The name of our distinguished President, as you are all aware, is associated not only with one of the most characteristic manifestations of the disease (Macewen's tibial spine) but also with an operation for the rectification of the rachitic deformities. Two important investigations into its presence or absence in India, and the reasons therefor, have been carried out by Glasgow graduates (Huntly[1] and Hutchison[2]), and it is needless to remind you that within recent years the Glasgow school has earned for itself a certain notoriety on account of the interest which it has evinced in the malady.

Though the two meetings are alike in the choice of subject, the present debate differs from the one of thirty-four years ago in that it is a conjoint one between the physiologists and the pediatrists. This is of course in consequence of the great amount of experimental work which, during the intervening years, has been done to elucidate the pathology of the disease, and the lion's share of this stands to the credit of the physiologist.

Although there is nothing farther from my intention than to belittle animal experimentation, as I appreciate only too well the great benefits which have accrued to medicine in consequence, and indeed much of my own humble energies have been expended in this direction, yet the final battle regarding the etiology of rickets, at least human rickets, must be fought out in the clinical field. It is the admission of this fact, I take it, which is responsible for the onerous and at the same time honourable duty of opening the discussion falling upon me, a clinician.

Clinical Generalizations.

In the life history of human rickets there are several broad facts with which any theory of its origin must be reconciled before it would be justifiable to adopt it as the correct

* Joint Discussion with the Section of Physiology.

explanation of its pathogenesis. In the first place, rickets has a special geographical distribution; this after all may mean nothing more than that it simply follows the distribution of industrialism. It is a disease, too, which is never found in races living under natural conditions, but which may become exceedingly rife among these same people when they adopt the habits of civilized man, as is evidenced in the case of the West African negro in New York and other American cities.

In the second place, the disease presents a marked seasonal incidence. This is a point of considerable importance in evaluating any clinical prophylactic or therapeutic test. This is apparent from Dr. Helen Mackay's[3] study of the effect of cod-liver oil and other fats in the treatment of the disease, and is also well borne out in the clinical investigations which Dr. J. D. Galbraith is at present carrying out in my own department.

In the third place, there is the broad fact that rickets is a disease of the poor, at least so far as Europe and America are concerned. Dr. Hutchison[2] has recently shown that in India, contrary to what prevails here, rickets is a disease of the wealthy. I know, of course, that there are many clinicians who do not consider that even in this country the disease is limited to the poor, and who hold that the children of the well-to-do also frequently suffer. They usually admit, however, that the disease under these conditions is much less severe and more amenable to treatment. In fact, one often hears employed the expression "prerachitic stage," whatever that may be. The whole point of course turns on the matter of diagnosis. Personally I am unable to make a certain diagnosis of rickets in the absence of either definite naked-eye or *x*-ray changes of the bones, and I would only ask if those clinicians who believe that rickets occurs in the better classes frequently meet with the characteristic *x*-ray appearances in these supposed examples of the condition. For any discussion on the cause or cure of a disease to be fruitful it is essential that there be agreement on what constitutes that condition, and though in the present case there may be some difference of opinion regarding the question of absolute immunity of the better classes, there is, I suppose, general agreement regarding the relative immunity enjoyed by that class—a fact which, for the purposes of my argument, is amply sufficient.

Diagnostic Criteria.

The question of diagnosis raises not only the previous point of what we are entitled to take as evidence of the existence of the disease, but also, and which is quite as important, what we are permitted in accepting as evidence of cure of the disease. Our own investigations on these matters have introduced us to certain perplexities. In any extensive clinical survey one not infrequently meets with a child running about and apparently quite active, and yet presenting on *x*-ray examination a very definite and severe degree of deficient calcification at the growing ends of the long bones. In another instance the child previously unable to walk is by some remedial measure apparently enabled to do so, but *x*-ray examination of the bones reveals not the slightest improvement. In still another example, also ostensibly in consequence of some therapeutic measure, the bones show very definite signs of healing, but the child remains as helpless and as disinclined to walk as ever. In the face of such findings what conclusions can be arrived at? If one is justified in ignoring the bone changes as an essential feature of cure, is one equally justified in diagnosing the disease in the absence of these same bone changes? In other words, is rickets a disease which may implicate any part of the body, but which attacks one part in one individual and another part in another? Such an assumption at the present moment, however, would tend rather to make difficulties than to help in the task of elucidation.

Diet as a Cause of Rickets.

The dietetic theory is undoubtedly of all the current theories the most popular, and to it therefore I would desire in the first instance to direct attention. As work on this aspect of the problem has proceeded, the importance of exactitude both regarding quantity and quality has become more and more apparent, and consequently much of the older clinical work must be discarded. Broad generalizations regarding diet, with no definite statements on either the exact nature or amount of food, characterize most of the work of our predecessors, and make it quite valueless as evidence in the present discussion. For the same reason I am willing to exclude our own study of the diets of rachitic and non-rachitic families; in these studies we attempted to form some idea of the amount of the various foodstuffs consumed by the child under consideration from an analysis of the total family diet. Such a method it is readily admitted can never give more than a mere approximation of what the child really obtains. Fortunately, however, within recent years clinicians have seen the necessity for greater precision regarding these matters, and we have at our disposal for consideration several investigations with such exact information. In the infant it should be remembered the question is not really so difficult as at first sight it might appear, owing to the extreme sameness of the diet at this period of life.

The clinical dietetic investigations can be divided into three groups: prophylactic, provocative, and curative. Hess was probably the first to carry out exact clinical experiments with the idea of testing the theory that animal fat or its constituent, fat-soluble A, possessed a prophylactic power. It was well known that the negro child in New York almost invariably suffered from the disease. Hess and Unger[4] therefore added to the diet of a certain number of those children from their earliest infancy crude cod-liver oil, and found that a much smaller proportion than usual developed the disease; in fact by this measure these authors held that they reversed the proportion of those usually attacked and those remaining free. We ourselves have also carried out a similar investigation, and found that of 27 infants receiving oil only 15 per cent. developed rickets, while of 30 controls 60 per cent. presented some evidence of the disease.

The first clinical tests to observe the behaviour of ossification in the infant while on a diet devoid of the fat-soluble A factor were also carried out by Hess.[5] Hess removed the milk fat from the diet of a certain number of infants by feeding them on dried skim-milk, replacing the fat by cotton-seed oil so that the caloric demands were supplied in the usual representative manner. He, however, saw no evidence that these children were abnormally prone to the disease. The vitamists of course have objected to the use of Hess's clinical experiments as bearing on the question of the rôle of fat on the ground that cotton-seed oil is one of the best of the substances poor in fat-soluble A. In 1919 we find cotton-seed oil classified by the Vitamine Committee[6] of the Medical Research Council among those fats not protecting against rickets, yet Mellanby[7] in his recent Oliver-Sharpey lectures states that its antirachitic power is moderate. One has a difficulty in understanding Mellanby's expression of opinion, since in his detailed work on experimental rickets, also published by the Medical Research Council, he records, in all, three experiments with cotton-seed oil, two of which developed rickets, and in the other he describes the bones as practically normal, though I must say the published *x*-ray picture of this special case does not substantiate this opinion. In almost immediate juxtaposition there is an identical picture from an animal of similar age fed on rape-seed oil, and believed by Mellanby to demonstrate rickets. To my mind both are definitely rachitic. Is it that Mellanby has been influenced in his opinion by Hess's clinical results? If so, then for similar reasons much of his dogmatism about fats and their antirachitic powers must be abandoned.

Other clinical tests of a provocative nature are also against the fat-deficiency theory. On the Continent during the war milk was exceedingly scarce, and this was, perhaps, nowhere more evident than in Austria. To make the milk go as far as possible Pirquet of Vienna devised the plan of doubling or even trebling its nutritive value by the addition of carbohydrate, so that the child would only require half or one-third of the usual quantity, and would thus only obtain, as the case might be, half or one-third of the normal amount of fat. In consequence of the good results gained with this type of feeding Pirquet was forced to review his older ideas of nutrition, and formed the opinion that fat was practically unnecessary, the only desiderata in the dietary being the requisite number of calories, and, on the basis that human milk is the ideal food, that 10 per cent. of these be derived from protein. He cited in support of his contention the low fat and rich carbohydrate diet of Eastern and tropical natives, just as Mellanby cites the diet of the Esquimaux as evidence for the necessity of fat. How can we reconcile two such different and apparently satisfactory diets, and the absence of rickets in both instances, with the antirachitic power of animal fat?

When visiting Vienna last spring (1921) I was informed by Pirquet and his assistants that they had not seen any ill effects from such a fat-poor and carbohydrate-rich diet, and quite recently Wimberger,[8] one of Pirquet's assistants,

has recorded the interesting history of male twins. One of these had been fed on a fat-poor diet and the other on a fat-rich diet, yet in both the osseous and general development were identical and quite satisfactory. More extended experience may, however, show that their first impressions were unduly optimistic, and we thus await with interest the report of the delegates of the Lister Institute, who, during the past two years, have been carrying out an extensive comparative study on this very point.

One must not forget in this connexion that feeding children on a fat-poor diet is no novelty. This has for years been a recognized method of dealing with certain cases of malnutrition, cases in which the error seemed to be a difficulty in digesting fat. Examples of this type of malnutrition are not uncommon, and in those which I have observed among the well-to-do there has been, to the best of my knowledge, no development of rickets, nor, I might add, any arrest of growth, this having as a matter of fact usually proceeded at a supernormal rate during the treatment. These experiences have rid me of the fear of feeding children on a fat-poor diet; but in order to test this point still further we have been observing, for some time past, infants fed on fat rich and fat-poor diets over prolonged periods, special attention being paid to changes in ossification. So far as we can judge there is no greater predisposition for the one set than the other to develop rickets, but Dr. J. D. Galbraith will, I hope, have an opportunity of supplying the details of this investigation.

Then there is the recent work of Hutchison[7] on rickets in India, which makes it difficult to understand how diet can be a factor of prime importance in its cause. Hutchison found in Nasik in India two social classes almost as sharply differentiated from one another, so far as diet and housing are concerned, as could be obtained under experimental conditions in a laboratory. The one class (the poor labourer and agriculturist) lived an open-air life, and the other (the wealthy Mohammedans and Hindus) inhabited houses the rooms of which were dark and airless, and in which the infant and female populations were more or less continuously confined. The infants of both classes were breast-fed for one or perhaps two years; the general diet of the poor was deficient, in fact almost devoid of fat and especially animal fat, whereas that of the rich contained this substance in moderate amount. It should be specially noted, too, in connexion with the matter of breast feeding, that it was the wealthy classes who consumed most vegetables, milk, and eggs, recognized sources of the antirachitic vitamin. Yet it was in the better classes, those consuming the richer fat diet, that Hutchison found not only early but late rickets prevalent, the poorer classes, though eating an almost fat-free diet, being comparatively immune. It is also interesting to record in this connexion that Hutchison found dental caries to be exceedingly and equally rare in both the rich and poor of Nasik and the surrounding districts of India in spite of the relatively poor fat diet.

So far as therapeutic tests are concerned we have the record of Dr. Mackay's[8] experiences in a London polyclinic. She treated cases of apparently active rickets by the administration of different types of fat. Unless during the summer months Dr. Mackay did not see any evidence of cure in spite of the addition of cod-liver oil and butter to the diet. Even during the summer in one case which was receiving 6 drachms of cod-liver oil daily the condition seemed to progress, so that the improvement which resulted in some of her cases may simply have been in consequence of the well-recognized tendency during the summer months to spontaneous recovery. It is also worthy of note that Cheadle and some of the others who took part in the discussion thirty-four years ago, and who were all whole-hearted believers in the deficient fat theory and in the efficacy of cod-liver oil, said that so far as the treatment of the disease was concerned they had more frequently to stop the cod-liver oil which was being given than to prescribe it. I might also be permitted to refer here to the experimental work of McCollum and others in which healing occurred during starvation of the animals.[16]

If the absence of fat-soluble A really be of importance in the etiology of rickets, why is keratomalacia so seldom seen in conjunction with it? I personally have not observed it in one single case of rickets in Glasgow. Keratomalacia for many years has been looked upon by clinicians as a condition due to the absence of fat from the diet, and experimentalists have more recently observed this relationship. Mori,[9] who saw a large number of cases in Japan, where the diet is notoriously deficient in fat, states that it is chiefly observed during the summer months (July to October), and that it is invariably found in association with defective fat ingestion or absorption, and in consequence he suggested the name "lipaporia." He describes almost the same miraculous cures of the condition with cod-liver oil as we ourselves are in the habit of seeing in the case of scurvy with orange juice. It is interesting to read how Mori tried the therapeutic value of different fats, finding cod-liver oil the best and olive oil almost without effect. As rickets is practically unknown in Japan, Mori states that there can be no question of this disease playing any part in the cause of keratomalacia. More recently Bloch[10] in Denmark has described an epidemic of keratomalacia in infants through their being inadvertently fed on a diet very poor in animal fat. If one is to admit that both rickets and keratomalacia are due to the deficient ingestion of fat, then I am afraid it is only by adopting the explanation suggested by some, that the different lesions in these two conditions are consequent on the deficiency of fat being associated with different combinations of the other constituents in a badly balanced diet—one of the most fantastic theories in modern pathology.

And finally, the fact that the disease develops on a diet of undiluted milk surely renders difficult of acceptance the suggestion that rickets is a deficiency disease, at least so far as fat and also calcium are concerned, as cow's milk contains on the average as much fat and four times as much calcium as human milk, the ideal infant food. Strictly speaking a deficiency disease is one due to insufficient ingestion, and I suppose the adherents of the deficiency theory accept this definition. Could, however, the disease be explained by deficient absorption—that is, supposing calcium, phosphorus, and fat-soluble A are the really important elements in the etiology that some believe them to be? Though it has been shown that, at least in full-blown rickets, absorption of fat is as good as in health, we know that in the early stages of the disease calcium retention (? absorption) is very deficient, and also that the amount of inorganic phosphorus in the blood is less than normal. The absence of rickets in marasmus and coeliac disease, both chronic conditions in which absorption is probably deficient, may be accounted for by the relatively slow rate of growth in these conditions. A certain rate of growth is essential for the development of rickets. But if the question be one of defective absorption then it must be defective absorption of a very special type, a type induced by a lesion permitting of a very selective action—a lesion that allows the elements necessary for growth to be absorbed, and yet at the same time deprives the economy of those requisite for regulating that same growth. It must also be a lesion that seldom if ever occurs in the well-to-do. To my mind such a hypothesis postulates a specific infection, a possibility which we must certainly entertain.

Environment as a Factor in the Cause of Rickets.

In our investigations in Glasgow, environment and general hygiene have always seemed to be factors of importance. I need not recall my own records of 1915,[11] or those carried out later by Miss Ferguson,[12] and the experimental work carried out in collaboration with Professor Paton. As a result of all these studies we concluded that overcrowding, poor parental care, and absence of open-air exercise were determining factors, the latter of which I personally was inclined to consider the most important.

Hutchison's recent observations in India lend considerable support to the idea that confinement is a factor of prime importance. He showed that the incidence of rickets was definitely related to the purdah system (a system only practised by wealthy Mohammedans and Hindus), which accounted not only for the fact that early rickets attacked both sexes—all infants being naturally treated alike—but also that late rickets only attacked females, who alone were affected by this system of isolation. I have already quoted Dr. Hutchison's experiments while discussing the question of diet; you will remember it was the class which consumed the largest amount of fat, and animal fat, who were affected. It has been argued against the validity of Hutchison's work that ghee, the chief vehicle of the fat in the diet of the Indian, is heated, and in consequence the fat-soluble A factor has been destroyed. If that be admitted then the investigation becomes as clear-cut an experiment on the effect of confinement as anyone could desire.

Modus Operandi of Confinement.

But if confinement is a factor of etiological importance, in what way does it exert its influence? Is it, as I presumed,

from deficient exercise and muscular movement, or is it, as some of the recent work suggests, due to the absence of the sun's rays?[13] Our own therapeutic tests with apparently active rickets rather support the former theory. We treated one series of children suffering from marked rickets with massage and electricity in hospital in town, another series in a hospital in the country, and still another series while they were resident in their own homes, the children being brought thrice weekly for treatment to the out-patient department. The cases that made the most rapid recovery, at least that were soonest able to walk, and in whom the *x*-ray evidences of healing occurred with average rapidity, were those who remained in their own homes and were brought to the out-patient department for treatment. This apparently anomalous result we were inclined to ascribe to the fact that while the children remained at home they got more outings in the open air, and more exercise through the rest of the members of the family taking the child out and teaching it to walk, and because the mother, according to instructions, also massaged the limbs and encouraged the child to walk.

Huntly,[1] in his paper in 1889, suggested that the freedom from rickets of the poor Indian child, in spite of the fat-poor and rich farinaceous diet, was due to the abundance of sunlight in India, and that the probable cause of the prevalence of the disease in Glasgow was therefore its comparative absence. Hutchison, too, in his paper states that he has seen rapid recovery in late rickets result from no other change than putting the patient on a balcony in the open air and sunshine, the diet being prepared at home, and being the same as that which had previously been taken.

In spite of the confirmatory experimental work[14] on the effect of sunlight there are, to my mind, certain difficulties in accepting it as the determining factor. As I have previously mentioned, we obtained better results in our cases by leaving the children in the city and carrying out massage than by sending the cases to our country branch, where undoubtedly there is a greater abundance of sunlight. Is the relative amount of sunshine enjoyed by the rich and the poor in Glasgow a sufficient explanation of its varying incidence in the two classes? If so, then the amount of sunshine absolutely necessary for normal growth must be very trifling considering the amount that is registered in a city like Glasgow during the winter months. The complete absence of rickets in Iceland, where for four months of the year the sun never shines, is also difficult of explanation on such a theory. If such were the explanation would one not also expect to find a far greater difference between the incidence of the disease in different parts of the world? On the Continent, from the system of heating, there is less pollution of the atmosphere, and, as is well known, a much greater amount of sunshine; yet, for example, in Vienna rickets is just as prevalent as it is in Glasgow, though there are double the number of hours of sunshine per annum.

That sunlight has a curative effect I am quite satisfied, but that does not necessarily mean that its absence is the cause of the disease. Sunlight, at least in moderation, exhilarates; and may it not be that its absence induces lethargy and thus leads to deficient exercise? Does sunlight exert its curative influence because a deficiency has been made good, by stimulating metabolism, or is it because of its antimicrobic powers on some infecting agent? We have the analogy of the effect of sunlight in tuberculosis, and also of the *x* rays and radium in tuberculosis and sarcoma. I feel that further work on these lines must be done ere we can definitely accept the conclusion that rickets arises from absence of sunlight qua sunlight. Sunlight usually means open air, better ventilation, and diffusion of infection. Let us rid our minds of the obsession that rickets must necessarily be a deficiency disease, due to the *absence* of something, whatever be the nature of that "something."

I refrain from entering into a discussion of the relationship between human and animal rickets, but I would ask, Are we certain that the disease as induced experimentally in the animal is the same as that arising spontaneously in the child? We should, I think, be very careful before concluding that because such and such follows certain measures in the case of the growing dog or rat the same changes must necessarily occur in the growing child. This same view of course has been expressed by McCollum,[15] one of the most extensive workers in this field. The numerous and conflicting findings in the experimental field have tempted some to suggest that there may be not only different types of rickets, but also that the disease may be dependent on many causes. Such suggestions are to my mind, if not ill advised, at least premature, and have been brought forward more with the idea of satisfying several unsubstantiated hypotheses than because there are definite facts forcing us to such a conclusion.

Conclusions.

Can we, then, in the face of these clinical facts and considerations conclude that diet is a determining factor of importance, let alone the direct cause of the disease? The undoubted prophylactic effect of cod-liver oil certainly suggests that some dietetic constituent present in the oil might be of moment, but the failure to cure the disease even by the administration of large doses of the oil is decidedly against the idea that its action is due to it supplying some ingredient essential for normal growth. At least rickets in this respect is very different in its behaviour from the known deficiency diseases, scurvy and beri-beri.

It would rather appear that somehow or other the etiology of rickets is associated with confinement. Whether this is due to want of fresh air, lack of exercise, or the absence of the sun's rays, or because confinement, overcrowding, and bad hygiene in general favour the development of some virus, it is impossible at present to say. In fact, it would appear that it is only by enlisting the aid of some virus that we can explain not only its geographical and social distribution, but at the same time the age and seasonal incidence of the disease. These are all points, too, with which we are quite well acquainted in the life history of the infections; and, if I might be permitted to conclude with a suggestion, it would be that in both the experimental and clinical fields the idea of rickets being of the nature of an infection should be more seriously entertained and investigations with this idea in view more generally undertaken.

REFERENCES.

[1] Huntly, W.: *Ajmere Rajputana Press*, 1889. [2] Hutchison, H. S.: *Quart. Journ. Med.*, January, 1922, p. 167. [3] Mackay: British Medical Journal, December 18th, 1920, p. 929. [4] Hess and Unger: *Journ. Amer. Med. Assoc.*, 1917, p. 1583. [5] Hess and Unger: *Journ. Amer. Med. Assoc.*, 74, 217, 1920. [6] Medical Research Committee, Special Report, 1919, No. 38. [7] Mellanby: British Medical Journal, May 20th, 1922, p. 791. [8] Wimberger: *Zeit. f. Kinderheilk.*, Bd. 31, 1921, p. 216. [9] Mori: *Jahrb. f. Kinderheilk.*, Bd. 59, 1904, p. 175. [10] Bloch: *Jahrb. f. Kinderheilk.*, Bd. 89, 1919, p. 405. [11] Findlay: *Lancet*, 1915, i, 956. [12] Ferguson: Medical Research Committee, Special Report Series, No. 20. [13] Huldschinsky: *Zeit. f. Orth. Chir.*, 89, 1920, p. 426; Hess: *Proc. Soc. Exper. Biol. and Med.*, 18, 1921, p. 298. [14] Park: *Journ. Amer. Med. Assoc.*, 78, 1922, p. 159. [15] McCollum: *Journ. Biol. Chem.*, vol. I, No. 1, p. 6, 1922. [16] McCollum and others: *Bull. Johns Hopkins Hosp.*, January, 1922, xxxiii, p. 31.

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It is a good thing that those of us who are actively engaged in investigating the factors involved in the development and cure of rickets should leave our work periodically in order to discuss the subject from the broadest standpoint, and to hear the criticism of both clinical and laboratory colleagues. It is more specially important that this should happen at the present time, because many results of research have been published during the past year, and, both from the point of view of the investigator, of the practising medical man, and of the public health worker, it is desirable that the new facts should be appraised, and their relative value decided upon. Fortunately, the medical profession are fully alive to the importance of the problem, largely, no doubt, as the result of the investigation initiated by the Medical Research Council. The controversy that has developed from these researches has probably been useful in attracting attention to, and intensifying the general interest in rickets. Whatever disagreement there may be among investigators as to the etiology of the disease, we all recognize that the complete eradication of rickets would do away with much bone deformity, improve the physique, lower the infant mortality, and, most important of all, improve the teeth of the people of this country beyond recognition.

But while we are agreed as to the magnitude of the problem, our views as to the most important factors in the etiology of the disease are very diverse. If, indeed, we were asked to formulate plans for eradicating rickets from this country, our recommendations would be so different as to suggest chaos. Some would strongly recommend housing schemes as a panacea; some massage and electricity applied to children from birth; some more sunlight and ultra-violet rays; while there are others who think that proper feeding of children would settle the problem.

While we are still suffering from the disability of ignorance, the narrowing down of the field by recent investigations suggests

that our present discussion will be fruitful; for important strides have been made on the hygienic side of the problem since Hansemann formulated his theory of domestication, and the dietetic hypothesis of rickets has also become more definite and concise as the result of recent research.

Much of the recent work on rickets has centred round the particular dietetic hypothesis of rickets which I have put forward,[1] and as I am anxious that my views should be correctly understood and not misinterpreted in this discussion, I wish to state these briefly.

Rickets, according to my view, is a disease accompanying growth, and is due primarily to defective feeding. What is a rickets-producing diet? It is one of unbalanced nature in that it contains too little of those foodstuffs responsible for the proper calcification of bone and too much of those substances responsible for the growth of tissue, these latter substances being either neutral or antagonistic to the deposition of calcium phosphate in the growing bony matrix. Assuming that the diet contains a sufficiency of calcium and phosphorus in a form that can be absorbed from the alimentary canal, the most potent influence for procuring the calcification of bone that I have observed up to the present is something of the nature of a vitamin having a distribution and properties somewhat similar to fat-soluble A.* On the other hand, foodstuffs responsible for growth and the laying on of tissue which are indifferent or antagonistic to calcification include the cereals. Generally speaking, therefore, rickets is a disease which follows the ingestion of diets relatively poor in the antirachitic vitamin and rich in growth-promoting elements, and more particularly in cereals.

The complication which has made this hypothesis of the etiology of rickets difficult to grasp is the new conception that the various essential factors of a diet are so interdependent that many dietetic problems must be considered from the point of view of balance, and that it is no longer possible to speak of "excess" or "deficiency" of substances in an absolute way. For instance, the amount of fat-soluble vitamin which may be sufficient in one diet becomes a relative deficiency when more cereal is eaten, or the calcium in one diet may be adequate but will become inadequate if the fat (butter) be greatly increased. In general, the minimum of any substance essential for perfect health and development is a variable dependent on the other factors of the diet eaten. The new dietetics which insists on the importance of quality as well as quantity must also find a way of expressing the fact that the value of a diet depends upon the relative amounts of its essential constituents and not upon absolute amounts.

It seems necessary to mention this point of view of diet, for much of the criticism against my work has been written as if I had suggested a kind of penny-in-the-slot hypothesis of rickets: abundant fat-soluble A in the diet, no rickets; absence of this vitamin, rickets. It ought to be superfluous for me to say that I have never written of rickets as a disease of this simple etiology. I wish also to take this opportunity of saying, in view of statements made in various places that I have altered my views, that I have not written of rickets as a disease uninfluenced by exercise and general environmental conditions. I have, however, always insisted that diet was the most predominant factor, and that environment was of secondary importance. Good hygienic conditions, in so far as they lead to greater activity and greater exposure of the skin to the ultra-violet rays of the sun, will no doubt prevent a moderate diet from producing the disease. Bad hygienic conditions will have the opposite effect, but, in my experience, a good diet will prevent rickets however bad the environment may be, and a really bad diet will result in rickets under the most perfect surroundings.

I propose now to deal with some of the more salient features of recent work in the light of my experimental results on animals, and, during the past eighteen months, of clinical observations on rachitic children.

The Influence of Dietetic Factors on the Development of Rickets.

(a) *The Interaction of Fat-soluble Vitamin, Calcium, and Phosphorus.*

In my experiments on dogs no difficulty was experienced in producing rickets by diets which contained abundant calcium and phosphorus, but were relatively deficient in fat-soluble A, so long as sufficient food was eaten. On the other hand, Korenchevsky[2] has found that, whereas the absence of fat-soluble vitamin in the diet only produces true rickets in a certain number of young rats, where there is an additional deficiency of calcium rickets develops in 100 per cent. of cases. Similarly McCollum and his associates,[3] also working on rats, found that a deficiency in the diet of an element present in large quantities in cod-liver oil (I shall assume for brevity's sake it is the fat-soluble vitamin) only produces osteoporosis, but, combined with a deficiency of phosphorus or calcium, and especially the former, in the diet, allows definite rickets to develop. The point of agreement in these various researches is that the fat-soluble vitamin in the diet has a potent effect in promoting calcification of bones, and what remains to be decided is the relative importance of calcium or phosphorus deficiency in the etiology of rickets.

The necessity of having a sufficiency of calcium and phosphorus in the diet before an abundance of good bone can be formed is obvious. If either is deficient during the growth of an animal, a condition of osteoporosis must result, but, whether it will be simple or complicated with rickets, will depend on the rest of the diet. Before discussing the matter further it may be well to state that I have already supplied evidence in support of the suggestion that the balance of calcium, phosphorus, and fat-soluble vitamin in the diet is important in ways more obscure and subtle than the simple deficiency of one or more.

I have shown, for instance, that too much butter in a given diet may result in bones defectively calcified, and that the antirachitic effect of butter is best obtained when it is balanced with a sufficiency of calcium. Again, the different action of caseinogen as present in milk, and that of acid-caseinogen as prepared from milk by acid precipitation—a substance deprived of its calcium—seemed to be most easily explained by some alteration in the calcium-phosphorus ratio. I mention these facts in order to show that I have previously considered the question of calcium and phosphorus in relation to the antirachitic vitamin, and suggested that it might be of importance in some special cases. I doubt, however, whether it has the practical importance in human rickets that the recent results obtained by different investigators, working on problems of rickets in rats, have suggested.

One possible cause of the difference in the experimental results of different workers may depend on the type of animal used—for whereas later investigators have worked on rats, my experiments were made on dogs. The differences in reaction to dietetic changes found among various animals are so notorious now that this point requires no emphasis. For instance, the failure of rats to develop scurvy in spite of the absence of the antiscorbutic vitamin from the diet is well recognized. Consequently, if there should happen to be any difference in reaction to diet between rats and dogs, which cannot be explained by differences in technique, then, in so far as the results have to be extended to children, I should unreservedly support the dog experiments, because of the closer similarity between the metabolism of a human being and a dog than between a human being and a rat.

There are, however, technical variations in the experimental methods adopted, which may explain the apparent discrepancies in the results. For instance, the dietetic conditions under which the rat-feeding experiments have been carried out were more strenuous than mine, more particularly in respect to the fat-soluble vitamin eaten. In the rat experiments a point has been made to eliminate this substance from the diet, whereas in my experiments on puppies the amount of separated milk allowed was fairly high, and must have contained some of this vitamin. Since cutting out the fat-soluble vitamin from the diet of rats stops growth after a short time, and since, in my opinion, rickets is a disease of or accompanying growth, it would not be expected that the preliminary slow growth, and the ultimate marasmus associated with this defect in diet, would be accompanied by a great development of rickets. It seems to me that, if the rats' diets contained a relative rather than an absolute deficiency of fat-soluble A, the better growth that would result therefrom might be compatible with more emphatic rachitic changes of bones, and these might possibly develop as in the puppy experiments even when the calcium and phosphorus contents of the diet were not deficient in amount. Not only do the conditions of feeding in the rat experiments call forth

* I shall call it the fat-soluble or antirachitic vitamin throughout this paper.

this criticism, but, as human rickets is the problem to be solved, the diets used are abnormal in ways not commonly met with in the feeding of children. It is unlikely that human diets, except under rare conditions, should be so deprived of fat-soluble vitamin as are the synthetic diets of Sherman and Pappenheimer,[4] and Korenchevsky,[2] in their rickets experiments on rats. If this did happen, much more keratomalacia would be found among children. It has been argued by some that the fat-soluble vitamin cannot be an important element in rickets because, under experimental dietetic conditions which result in keratomalacia owing to the absence of this vitamin from the diet, rickets does not necessarily develop. This criticism seems to me to miss the point of my work, for, whereas keratomalacia appears to result from a simple defect of diet—namely, the absence of the fat-soluble vitamin—rickets is more complicated in that, so far as the bone is concerned, it is the outcome of a race between growth of bone and calcification of that bone. The antirachitic vitamin reacts with calcium and phosphorus on the diet, and thereby controls the actual calcification process, but there are other factors involved in the development of rickets, such as the amount of cereal eaten, and these additional factors make the two diseases of malnutrition under discussion largely independent, although one and the same dietetic factor plays an important part in the etiology of each disease. Keratomalacia is a rare disease because it is only seldom that the diet is practically devoid of fat-soluble vitamin, but, on the other hand, a relative deficiency of this substance in many articles used in the feeding of children is common, and rickets is widespread.

Further, it is unlikely from a consideration of diets which produce rickets in children that the calcium and phosphorus deficiencies are of prime importance. This remark applies more particularly to the question of phosphorus, the importance of which is being so stressed in many recent publications. Although children develop rickets when the calcium content of the diet is adequate, it is true, nevertheless, as I have pointed out elsewhere, that a diet deficient in fat-soluble A is likely to be deficient also in calcium, for these substances are often closely associated in their distribution in natural foodstuffs. For instance, milk, egg yolk, and green vegetables are rich sources of each, whereas flour, rice and maize, pulses, potatoes, sugar, and jam are almost devoid of both. When, however, we consider the phosphorus content of various foodstuffs and their relation to rickets, there is no evidence that phosphorus deficiency is a problem of practical importance, although the observations of Sherman and Pappenheimer[4] and Shipley, Park, McCollum, and Simmonds[3] on this point may be of great scientific interest. It has been said that a combined deficiency of phosphorus and fat-soluble vitamin in the diet produces more typical rickets than that produced by a deficiency of calcium and fat-soluble A. I am unable to pronounce any opinion on this point, but I have little doubt that some specific relation exists between the antirachitic vitamin and phosphorus. In 1918 I failed to obtain any evidence that this vitamin had the direct influence on the formation of calcium carbonate in eggshells that it exerts on the combination of calcium and phosphate in bone. Parenthetically, I wish to allude here to the experiments of Pappenheimer, McCann, and Zucker,[5] made to test the efficacy of the fat-soluble vitamin in preventing rickets and in promoting the deposition of calcium phosphate in bone. They failed to show that the vitamin exerted such influence, but as they first took the precaution to remove most of the phosphorus from the diet their experiments will probably not be accepted as crucial.

I find it impossible to interpret my own experiments in terms of much of the recent American research on rickets in rats, where the standard rickets-producing diet is deficient in both the fat-soluble vitamin and phosphorus.[4] It is true that meat has some antirachitic action, and this may be related to its high phosphorus content, but its effect in any case is small. Again, separated milk powder when given in large quantities, with the cereal element of the diet low, has an antirachitic action. This may be related to its high phosphorus content. As mentioned above, however, there is undoubtedly some fat-soluble vitamin left in separated milk, and its action on calcification becomes apparent when large quantities are ingested. When, however, the rickets-producing effect of the cereals is considered, it is manifest that phosphorus is of secondary consideration, because oatmeal, which has the strongest effect in inducing rickets of all the cereals so far examined, has also the highest phosphorus content, the P_2O_5 in oatmeal, flour, and rice being of the order 1.25 per cent., 0.25 per cent., and 0.2 per cent., respectively.

(*b*) *The Effect of Cereals.*

Whereas the fat-soluble vitamin working in conjunction with calcium and phosphorus ensures the calcification of bone, other elements in the diet have an influence in promoting the laying down of new bony basis without at the same time ensuring its calcification. Whether they actually inhibit calcification or are simply indifferent to this change is not certain, but in either case they have a definite rickets-producing effect as opposed to the calcifying or antirachitic action of the vitamin substances discussed. The worst offenders are the cereal and carbohydrate elements of the diet. This action of food was suggested by Cheadle[6] and has been long discussed by clinicians, but, as far as I know, the fact has never been proved until recently, and there was no experimental evidence in support of it.

I have shown that, when puppies eat diets which are complete except for a deficiency of fat-soluble vitamin, the severity of the rickets produced depends on the amount of cereal eaten if all other conditions are constant. If, for instance, a puppy A eats $2x$ bread as compared with B eating x bread, then, all other conditions being constant, A will develop worse rickets than B. I thought at the time, and I attempted to prove, that the carbohydrate moiety of the cereal was the essential element responsible for the action. These latter experiments were not very successful because of the difficulty in getting young puppies to eat diets deficient in fat-soluble A and rich in pure carbohydrate such as starch, cane-sugar, or glucose. Nevertheless, the results obtained suggested that the carbohydrate in itself played some part in the production of rachitic symptoms. In view of my more recent experiments, however, it is difficult to believe that the rickets-producing effect of cereals is wholly due to their carbohydrate content, and I am at present engaged in finding the new factors involved. The most prominent fact brought out in the cereal experiments is that oatmeal has a greater rickets-producing effect under the conditions of these experiments than equal weights of flour, especially white flour, or rice. Since the amount of carbohydrate in oatmeal, wheaten flour, and rice is respectively of the order 65 per cent., 7.35 per cent., and 77 per cent.—that is to say, there is less carbohydrate in oatmeal than in the other cereals—it is manifest that the greater rickets-producing effect of oatmeal as compared with the other cereals cannot be due to its carbohydrate moiety.

In some way the effect of cereals is no doubt related to their property of producing growth, both in the sense of producing longer and bigger bones and an actual increase in weight. This action of cereal is best illustrated by contrasting its effect on the metabolism with that of fat. Adding more cereal to a diet already adequate causes young animals to increase more rapidly in weight, to develop a deposit of fat which is undoubtedly formed from carbohydrate, and to become more lethargic. Under the same conditions the addition of fat makes no difference to the rate of increase in body weight, for it neither increases the laying down of tissue nor is it deposited subcutaneously as dépôt fat. It is burnt up and increases the metabolism. These opposite effects of cereal and fat on the metabolism of young animals are most striking and have probably not received the attention they deserve.

Cereals, then, increase the laying down of fat and tissues generally, including the bones, and thereby make a greater demand on the calcification processes, so that any tendency to lag behind in this respect is increased by allowing the child or animal to eat a larger quantity of cereal. Increasing the bread, therefore, in a diet slightly rickets-producing only emphasizes the disease and causes the development of larger quantities of cartilage and osteoid tissue in the bones. This explanation, however, is not a complete one, for it does not satisfactorily explain the differences between oatmeal, white flour, and rice. In some series of experiments there was no obvious difference between the rates of growth or in the rates of putting on weight when oatmeal, white flour, and rice were the only variables, yet the rickets produced by oatmeal was much greater than that produced by equal quantities of the other cereals. Undoubtedly some other factor in oatmeal is at work which either prevents endochondral calcification or increases the formation of tissue at this point, thereby producing a relative lag in calcification at the ends of the bones. It does not appear to be the carbo-

hydrate moiety, and as I pointed out in a previous Section the larger amounts of calcium and phosphorus in oatmeal discredit any explanation which centres round deficiency of these substances. Further experiments will have to be carried out before a definite pronouncement can be made on this point.

Factors of Hygiene and their Influence on Rickets.

The two factors of hygiene that influence rickets, evidence of whose action rests on a definite experimental basis, are exercise and sunlight. The evidence that infection is of any importance in this respect seems to me too meagre at present to warrant discussion.

I have dealt elsewhere[1] with the exercise hypothesis and Findlay's claim[13] that it is the most important factor in the etiology of rickets, and will only state here that, in my opinion, the exercise taken by a child at the ordinary period of rickets development consists of small movements; also that this general activity depends almost entirely on its diet and not on its environment. Diet not only, therefore, has its direct action on the tissues of the body—including, from our particular point of view, the bones—but, by controlling the activity, has an indirect effect.

The second factor of hygiene—namely, sunlight—has quite recently come into great prominence as the result of experimental work, and demands closer consideration. The recognition of the antirachitic action of sunlight has been gradual and is the outcome of Huldschinsky's[7] observations of the curative effect on rickets exerted by the ultra-violet rays emitted by the mercury-vapour quartz lamp. Later, he supplemented the ultra-violet ray treatment of rachitic children with sunlight, whereas Riedel[8] treated cases of rickets by sunlight supplemented with ultra-violet rays on sunless days. Hess and Unger[9] then showed that sunlight alone is capable of bringing about curative changes in rickety bones. There is now but little doubt that it is the ultra-violet rays of sunlight which are the effective agents. Many publications have appeared recently on this subject, and the action of sunlight in stimulating calcification processes in bone is generally accepted.

This effect on calcification of bones is of great interest, but of even greater importance is the recognition that sunlight has a much wider influence, especially in the case of animals on defective diets, for in these cases it is capable of stimulating their appetite and increasing the rate of growth and activity. Even cases of latent tetany (Sachs[10]) and definite tetany (Huldschinsky[11]) have been cured by ultra-violet rays. It is evident, therefore, that the ultra-violet rays promote some chemical change in the body which results in profound modification of many activities. Since these rays have very little penetrating power it is probable that their action is on the skin, and that some powerful chemical substance is thereby liberated. Hess[12] has pointed out that the antirachitic effect of the ultra-violet rays is smaller in the case of black rats as compared with white rats. Certainly in the case of puppies with dark hair the effect of sunlight in preventing the development of rickets, when placed on rickets-producing diets, is, in my experience, negligible. It is interesting that sunlight, when it strikes the skin, produces changes in the bones and general condition of rachitic children and animals in some ways comparable to the effect produced by giving cod-liver oil, and it seems possible that the fat-soluble vitamin is the substance liberated into the circulation by the action of the ultra-violet rays on the skin. If this is the case then sunlight and ultra-violet rays ought to have other specific effects, such as (1) the cure of xerophthalmia, when the diets remain devoid of this vitamin, and (2) resumption of growth in young rats when growth has ceased owing to lack of this substance in the diet. Should these results be produced by exposure of the skin to ultra-violet rays, no doubt will remain as to the chemical substance set free into the circulation.

The scientific importance of these facts is obviously great, for they appear to open up a new field in physiology, but, in evaluating their importance in the prophylaxis and curative treatment of rickets in children, we must not be carried away by the interest of the subject. It will be agreed that, if the sunlight has to pass through clothing, its effect on the skin will be greatly diminished, if not destroyed, and even in its passage through window glass its ultra-violet rays are lost. Then, again, it is customary for a mother in this country to prevent sunlight falling directly on the only uncovered part of an infant out of doors—namely, its face. All things considered, the amount of direct sunlight falling on to the skin of a child in its first year of life, a time when it is most susceptible to rickets, must be very little. I am inclined to think that in this country at least the part played by sunlight in preventing rickets is small. If it be answered that rickets is rife in this country for the reason that children are not exposed to sunlight, then, I ask, are the excellent teeth and absence of rickets in the Eskimo in his natural surroundings due to exposure of the skin to the sun during infancy? In tropical countries, where less clothing is worn and more sunshine is obtained, the ultra-violet rays undoubtedly hold a place of greater significance, although even here nature tends to diminish such influence by depositing pigment in the skin.

If it should happen, as seems possible, that the chemical hormone liberated by the sunlight is the antirachitic vitamin about which much of my experimental work on rickets has centred, then it only serves to emphasize the importance of diet in the etiology of this disease. For, although we cannot control sunlight, we can control the diet and we can see that it not only contains an adequate amount of this substance, but that it is so balanced with other factors that full use is made of it in the metabolism of the child.

I suggest that the following statements will cover most of the conditions where diet and sunlight interact:

(1) That when a child is well fed the presence or absence of sunlight makes no difference to its health in so far as rickets is concerned.

(2) That in the case of a child fed on a mediocre, borderline diet, exposure of the skin to sunlight will probably prevent rickets.

(3) That in the case of badly fed children—that is, when diets contain much cereal and a deficiency of fat-soluble vitamin and calcium—sunlight will not prevent rickets, but may ameliorate the symptoms to some extent.

It will be seen that, as in the case of exercise, so in regard to this other condition of hygiene—namely, sunlight—I consider it to be of secondary importance to diet in the etiology of rickets.

Diet and Rachitic Children.

A typical diet that I give to children with severe rickets is as follows:

Milk, 1 to 1½ pints.
Beef dripping, 1 to 2 oz. with bread.
Meat, 1 to 2 oz.—usually raw scraped and mixed with potatoes.
One egg.
Milk pudding.
One orange.

This diet alone will bring about rapid improvement, but the process of healing is hastened by the administration of cod-liver oil, 1 to 4 drachms t.d.s. In a recent publication Findlay[14] states that cod-liver oil produces very little clinical improvement, although definite evidence of healing, as seen by radiograph, can be observed. He further states that the administration of cod-liver oil and phosphorus does not produce healing of bones any more speedily than that produced by massage and electricity, which, he says, takes two or three months before any change in ossification of the bone can be noticed. I have had no experience of massage and electricity as a treatment for rickets, but there is no difficulty in producing great improvement in calcification of bones by the above diet, especially if cod-liver oil be added, during the course of one month. More noticeable, however, is the improvement in the general condition of these children apart from the calcification of bone. The most lethargic and miserable of infants, even in the later old-standing cases when a marasmic and semi-paralytic condition has developed, become bright and active. So active, indeed, do they become, when treated in the above-described way, that in many cases their cots have to be netted. Children, in fact, react to diet in the same way as do puppies, and the influence of diet on muscular movement is so prominent that I am surprised no observations of this type have been made by the Glasgow workers. However small a kennel, and however unhygienic its surroundings, with no access to sunlight and no special precautions as to cleaning, a properly fed puppy will remain very active and free from rickets. It is equally easy, by improper feeding, to make other puppies listless and lethargic, with but little desire to run about even when placed

in open fields. By improper feeding I do not mean starvation, for these animals are usually fat and look well nourished. It is also a matter of common experience that diets of high cereal content more particularly produce fat, lethargic, and contented children, whose small movements and general activity are subnormal, although the other environmental factors may be good. Nothing is more dramatic than the change in behaviour produced in rickety babies when the diet is altered to the type previously described. Clinical improvement and increased calcification and growth of bone are synchronous, and both are obvious within a few weeks of giving the good diet.

It is true that cases of rickets in children occasionally appear where it is difficult to account for the disease on the basis of the facts as I have described them. Investigation often shows that these cases are associated with some exceptional condition —such, for instance, as premature birth, or twins, or, in some cases, the children may have just recovered from a severe infection. But these cases only indicate that we have still much to learn of the factors which control the growth and calcification of bone. In my experience, all rachitic children react favourably to a good diet such as I have described.

There is one point about this dietetic treatment of rickets that may give trouble—namely, the fat dyspepsia that cod-liver oil may produce in some cases, more especially if the other fat in the diet is kept high. Some children in the early stages of treatment can only tolerate a moderate amount of fat, and are made ill by 2 ounces of beef dripping and 6 or more drachms of cod-liver oil per diem. If this happens, all recovery processes cease, and the sickness and other symptoms may be severe. It is well in these cases to cut down all the fat in the diet, and, starting with smaller quantities, to increase it step by step.

REFERENCES.

1 E. Mellanby: *Lancet*, 1919, i, 407: Ibid., 1920, i, 550; Medical Research Council Special Reports, No. 61.
2 Korenchevsky: British Medical Journal, 1921, ii, 547.
3 McCollum, Simmonds, Shipley, Park: *Journ. Biol. Chem.*, 1921, 47, 507.
4 Sherman and Pappenheimer: *Journ. Exper. Med.*, 1921, 34, 189.
5 Pappenheimer, McCann and Zucker: *Journ. Exper. Med.*, 1922, 35, 447.
6 Cheadle: *Artificial Feeding and Food Disorders of Infants*, 1906, p. 200.
7 Huldschinsky: *Zeit. f. Orthop. Chir.*, 1920, 89, 426.
8 Riedel: *Münch. med. Woch.*, 1920, 67, 838.
9 Hess and Unger: *Journ. Amer. Med. Assoc.*, 1921, 77, 39.
10 Sachs: *Münch. med. Woch.*, 1921, 68, 985.
11 Huldschinsky: *Zeit. f. Kinderh.*, 1920, 26, 5.
12 Hess: *Proc. Exper. Biol. and Med.*, 1922, 19, 238.
13 Findlay: British Medical Journal, 1908, ii, 13.
14 Findlay: *Lancet*, 1922, i, 825.

DISCUSSION.

Dr. Robert Hutchison (London) said: Any contribution I can make to this discussion must be from a purely clinical standpoint, but it is perhaps not altogether superfluous to point out that in trying to determine the nature and cause of rickets clinical observation, if it be sufficiently extensive, may be just as valuable a guide as laboratory experiments. We may also legitimately inquire at the outset whether it is quite certain that one may safely argue from the experimental rickets artificially produced in animals to the disease as seen in the child. This inquiry is all the more pertinent when it is remembered that the experimental results seem to vary with the animal employed, whether dogs, rats, or calves. Leaving aside these preliminary questions, I think it will be generally agreed amongst clinicians that neither of the two rival present-day theories of rickets, the dietetic nor the hygienic, will by itself quite meet all the facts. Clinicians have long recognized that bad hygienic conditions and, in particular, want of sunlight favour the development of the disease. This was clearly pointed out by Cheadle twenty years ago. On the other hand, it is difficult to believe that the hygienic factor is the only one concerned in the production of rickets, seeing that, as every clinician knows, the disease can be cured by altering the diet without any other change in the environment. If this were not so the out-patient treatment of rickets would be almost hopeless. It is for this reason that the great majority of clinicians have hitherto attached chief importance to the dietetic factor, and the kind of diet which is regarded as most apt to give rise to rickets is one which contains little fat and protein and a relative excess of carbohydrates, and chief stress has always been laid on the importance of poverty in animal fat. The question then arises, Is it deficiency of fat as such that causes the disease, or deficiency of a fat-soluble vitamin? This brings us to the vitamin theory, and here again the clinician has difficulty in agreeing whole-heartedly with its advocates. The reason is that rickets may certainly develop on diets which cannot be by any means absolutely lacking in fat-soluble vitamin, even although they may exhibit a relative deficiency of it. The observations of Miss Chick on children in Vienna, and of Dr. Hess on rats, seem also opposed to an acceptance of the extreme vitamin view. It may be argued that the undoubted curative effect of cod-liver oil in the disease is in favour of the vitamin theory, but it was the experience of many clinicians during the war, when cod-liver oil was unobtainable and cotton-seed oil had to be substituted for it in out-patient practice, that the latter seemed to be almost equally efficacious as a curative agent.

It is interesting to note that the supporters both of the vitamin and of the "defective hygiene" theories seem to be gradually shifting from their original point of view. The former tend to speak now of a relative rather than an absolute deficiency of vitamin and to invoke as necessary concomitants an excess of starch in the diet and perhaps a deficiency of calcium and phosphorus. On the other hand Dr. Findlay, as a protagonist of the hygiene school, now tentatively postulates a possible "virus" as the exciting cause of the disease. If by this he means a microbe I think he will not find many clinicians to agree with him. That rickets is an infective disease is an hypothesis which is *a priori* extremely unlikely. Rickets has none of the usual clinical characters of such a disease, but suggests much more a purely metabolic disorder like gout or diabetes. It is quite likely that many factors, dietetic, hygienic, and other, acting singly or in combination, are able to bring about the general disorder of metabolism called rickets just as gout may be caused either by errors of diet or by insufficiency of exercise or by both. What we chiefly need, I would suggest, is a more profound study of the metabolism of the disease on lines such as those which Professor Noël Paton has initiated in his researches on the lipoids.

Professor D. Noël Paton made the following contribution to the discussion.

Milk Fat.—I wish to consider first the practical question, Is there any evidence that milk fat (butter) is a potent anti-rachitic agent? not the academic question of whether possibly it may contain small amounts of some agent of this kind. It is a point of considerable practical importance, because, largely as a result of the memorandum issued by the Vitamin Committee of the Lister Institute and the Medical Research Council, there is a widespread conviction that milk fats are of primary moment in this respect, and much expenditure is being incurred to secure their supply. In the memorandum they speak of the antirachitic as identical with the "fat-soluble A growth factor," and they give certain directions for the prevention of rickets, stating that "milk and butter are the best sources of this antirachitic factor for young and growing children." They also publish a table giving the relative proportion of the antirachitic factor in different foods in which butter and cod-liver oil are placed equal at the head. The conclusions are avowedly based upon the partially published results of E. Mellanby. It is for this reason only that I must examine his evidence. He states, in his *Experimental Rickets* (1921, p. 18), that a diet of from 175 to 250 c.cm. of separated milk and bread produces "rapid and marked rickets in well-growing pups." To argue from this that the development of rickets is due to the deficiency of a fat-soluble A substance in butter is hardly justifiable, since when the dogs reach the size of 4,000 grams and are then getting from 43 to 62 c.cm. per kilo of body weight, the CaO intake is seriously reduced—to 0.07 to 0.1 gram per kilo. The normal retention on a diet adequately rich in CaO is about 0.15 gram per kilo. Thus two factors at least are involved—namely, decrease of milk fat and decrease of CaO. At regards the action of milk fats in preventing the onset of the disease, I can find definite experiments on only three dogs. Two remained free from rickets; one developed the disease (pp. 20, 23, 29; the last given also on p. 48). In the experiments on pages 28 and 37 butter fat was given, in one with linseed oil, in two with meat, which Mellanby states plays some part in preventing the onset of rickets. Yet one of these is noted as "practically normal," one as "nearly normal," which means that they had some signs of rickets, and one as "slight rickets." The contention that whole milk has a curative action seems based upon one experiment (p. 65), in which, after the development of rickets on crushed palm kernel, milk was substituted and improvement occurred (Figs. 15, 16, 17). That this was due to the milk fat is

rendered doubtful by the next series of figures (Figs. 18, 19, 20) showing still more marked curative changes, the palm kernel being continued with no change in the diet—an example of the spontaneous cure which makes the investigation of curative agents so unreliable. On the curative action of butter I can find only one observation on one dog (p. 66). This does not justify a conclusion being drawn. The evidence does not therefore seem to me to warrant the recommendations of the committee, and it is unfortunate that a scientific body should, without more proof, have interfered in practical dietetics.

In our experimental work we have thought it necessary to use large numbers of pups of the same litter, since individual susceptibility makes observations of single pups, as adopted by Mellanby, quite unreliable. In 1918 we showed: (1) That pups (11) on from 100 to 200 c.cm. of whole milk (3 to 6 grams fat) and oatmeal porridge, kept in the laboratory, developed rickets. (2) That pups (5) upon skimmed milk (2.8 grams fat) and oatmeal porridge, when kept in the country, grew up without signs of rickets. In 1921 we recorded experiments (4) confirming our previous conclusions (1) and showing the following results: (3) That pups (8) might be reared in the laboratory free of rickets on separated milk and bread with only 0.5 gram milk fat per kilo of body weight, provided the diet yielded sufficient energy, and provided scrupulous cleanliness was observed. (4) That butter fat has no curative action in rickets (1918 experiments—4 pups; 1921 experiments—2 pups). The results of Hess (*Proc. Soc. Exper. Biol. and Med.*, 1920, 21, 266) indicate that butter fat has no antirachitic action, either prophylactic or curative. McCollum, Simmonds, Shipley, and Park have arrived at practically the same conclusion (*Amer. Journ. Hyg.*, 1921, 1, 512). Hutchison's Indian results give no support to the view that milk fat is of special value, and we know that thousands of children grow up without rickets on less than a quarter of a pint of milk a day.

The evidence thus seems to be all against the importance of milk fat as an antirachitic agent. Miss Chick and her fellow workers seem to have given it up for cod-liver oil and sunlight.

Cod-liver Oil.—The old view of the clinicians that cod-liver oil has an influence in delaying the onset and hastening the cure of rickets has been supported both by Mellanby, whose conclusions are, in this case, based upon an adequate number of observations (9 dogs), and by such recent work as that of Hess, McCollum, and their co-workers. Their work, however, has gone far to disprove the connexion between the antirachitic agent in cod-liver oil and the fat-soluble A substance.

Other Antirachitic Agents.—Not only has cod-liver oil this prophylactic and curative action, but (1) we now know that sunlight and ultra-violet rays act in the same way; (2) we know that healing of rickets in rats occurs during starvation; (3) we know that spontaneous recovery from rickets without change of diet frequently occurs (Mellanby, Figs. 18, 19, 20); (4) we know that a change in the salt ration of pigs, as demonstrated by Elliot and Orr, leads to a cure; and (5) lastly, the evidence afforded by McCollum and others shows that simple lowering in the phosphorus to calcium ratio in the diet may be associated with rickets-like changes in the bones of rats. This one naturally correlates with the decreases in the inorganic phosphates of the serum first observed in rickets by Howland and Kramer. But is this not merely an indication of an alteration in the metabolism of the much more important organic phosphorus compounds? Some factor other than the absence of a vitamin must be involved.

Calcium.—The influence of the supply of calcium requires more attention, although many investigations have been made since E. Voit's study. The supply of phosphorus is always adequate in any diet. Mellanby states that "plenty of calcium and phosphorus in the diet" tends to prevent rickets in puppies, but I can find no experimental evidence in his report to justify the conclusion (? p. 52). I would ask him where it is to be found, and I would ask him if it is right to place butter among the foodstuffs rich in calcium, stating that it contains 0.37 per cent. CaO, while, at most, only about 0.04 per cent. is present. Egg yolk contains about 0.14 and not 0.4 per cent. Cabbage surely does not contain 0.45 per cent.: Sherman gives 0.063. This is an important matter, for he now states that abundance of calcium and vitamin A are often associated in foods. For observations upon diets poor in calcium and in vitamin A we have used lean meat and bread. Our experiments (4 dogs) show that pups may be reared free of rickets upon such a diet, if an amount of calcium is added to the diet equivalent to that yielded by about 100 grams of milk per kilo—that is, 0.16 gram. On a low CaO intake of 0.035 gram per kilo osteoporosis and possibly rickets developed. This seems to me to indicate that the influence of the salts is prepotent. Pups at least can be reared without milk or cod-liver oil. I cannot understand the evidence upon which Mellanby concludes that meat retards the development of rickets. I find experiments upon 7 dogs on meat recorded and in all the pups developed rickets, that getting most meat becoming the most rickety. He seems to me to draw conclusions in spite of and not on account of his experiments. In these experiments the dogs were getting a totally inadequate supply of calcium.

Bread.—The theory has been advanced by several clinicians that excess of carbohydrates induces rickets. Mellanby supports this view, insisting that excessive bread is provocative of the disease, and he concludes that "probably the most common cause of rickets in children is a combination of relatively deficient antirachitic vitamin and excessive bread"—a very important practical conclusion, if true. On this subject I can find experiments upon only 5 dogs (p. 43) in which the intake of bread was measured. All developed rickets, as well they might, on a diet so poor in calcium. I calculate that he gave his dogs from 26 to 50 grams of bread per kilo per day. We have reared 16 pups free from rickets on separated milk with a much larger intake of bread—from 42 to 64 grams per kilo per day. In his conclusion (p. 75) he includes with "excess of bread" "other cereals." To-day he has given some results with oatmeal which raise the question of whether the cooking was adequate. Not a single experiment on these is recorded, although the calcium content of cereals differs greatly. On sugar, the only carbohydrate tested, I can find one experiment on 3 dogs, 2 of which got sugar, 1 of which did not. All developed rickets. On other carbohydrates there are no observations.

I do not think that on such evidence we are justified in concluding that bread, cereals, and sugar have so prejudicial an influence.

Infection.—The familial incidence of rickets and its association, in Glasgow at least, with overcrowding and bad hygienic conditions has suggested the possibility of a microbial origin. This has never been adequately investigated. The older workers and the more recent work of Korenchevsky do not seem to me to throw light upon the question, because infection must be from case to case by the blood through fleas, lice, or bugs, or through the alimentary canal or respiratory tract, possibly by faecal infection. To test these possibilities we have inoculated pups (3) with the blood from cases of active rickets, and we have added to the food of others (8, with 8 checks) faeces from cases of active rickets. Entirely negative results have been obtained. But this raises the question—Is rickets in dogs the same as human rickets?

What, then, is the present position of our knowledge of the etiology of rickets? There is no evidence that it is *caused* by a lack of milk fat or anything connected with it. There is no evidence that it is caused by an excess of carbohydrates or of bread. There is no positive evidence that it is an infective process. Admitting that sunlight and cod-liver oil are prophylactic and curative, as they also seem to be in tuberculosis, is their absence the cause of the disease? It is true that in all probability by their systematic use many infants might be reared free of rickets who would otherwise develop the disease, but does that mean that their absence is causal? Children in the high Norwegian valleys far from a supply of cod-liver oil, and without sunlight for five months in the year, grow up free of rickets. It seems to me that these agents must act by producing such a change in the metabolism as enables the child to resist or to throw off the condition. Pups reared in subdued light are most lethargic, and I need only refer to the investigations of Leonard Hill on exposure to sunlight and air. Their influence on the general metabolism urgently requires investigation, and wild theories as to the production of fat-soluble A in the skin are better withheld till evidence is collected.

What the real *cause* of rickets is we know no more than Glisson did in 1650, or Soranus Ephesius in A.D. 100; and we know practically nothing of the modifications of the metabolism which are the essentials of the disease and which are the cause of the bone changes. Even the interpretation of *x*-ray pictures is not clear. Some appear to consider that the cupping at the end of the long bone is a process of decalcification, while it may simply be an abnormality in intracartilaginous ossification with a

persistence of the periosteal growth. I feel strongly that it is the duty of those of us who are trying to solve these problems not to work in isolation, but to combine and to devise and carry out a definite plan of campaign, and to refrain from theories till we have accumulated facts.

Professor Korenchevsky (Lister Institute, London) said: On comparing these experiments with those of other authors, I am forced to the conclusion that the principal results are in agreement with Mellanby's experiments, and would appear to disagree with the results arrived at by other authors in their experiments with diets deprived of the antirachitic properties present in milk, some fats, and especially cod-liver oil—that is, diets deprived of the so-called vitamin A. Only Mellanby (in his experiments on puppies) and I (in my experiments on rats) managed to obtain rachitic changes of the skeleton. The circumstances under which, in my experiments, osteoporosis alone of the skeleton was obtained explain the apparent contradiction. The quite imperceptible transitions, in my experiments, from the histological picture of osteoporosis to that of rickets, as well as the fact that the skeleton can at the same time show both rickets and osteoporosis, demonstrate as follows: In osteoporosis, or rather, owing to the causes producing osteoporosis, the rachitic changes of the skeleton may remain latent, as an energetic formation of new bone is required for their manifestation. This supposition is further confirmed by the chemical changes of the skeleton, which are, on the whole, the same in all cases. Similarly, in human rickets, according to the opinion of the majority of investigators, there is no essential difference between osteoporotic and hyperplastic rickets, between latent rickets in cachectic children and rachitis florida in more satisfactorily nourished children. All the conditions which have a marked influence on the growth of tissues—that is to say, starvation, exhausting diseases, deprivation of substances stimulating the growth of tissues (vitamin), and so on—will conduce to the appearance of osteoporosis of the bones. The mechanism of development of this skeletal disorder has nothing in common with rickets, as the cause of rickets lies in the disturbance of calcium metabolism, while osteoporosis is caused either by delay in the formation of new bone or in the increased destruction of old. Then why is it that, when the organism is deprived of vitamin A, rickets is so frequently associated with osteoporosis? That unknown principle x, which goes by the name of vitamin A, has two chief properties: that of stimulating the growth of tissues and that of regulating the metabolism of calcium, particularly in the bones. McCollum and his collaborators suggest the existence of different vitamins acting on the two lines above mentioned. Up to the present time a complete separation of these properties of vitamin A has not been possible. In depriving an animal of vitamin A, the bone tissue is deprived of both the influences above mentioned, while the absence of a stimulant for the growth of bone in conjunction with its continued destruction must inevitably result in osteoporosis. In addition to this there is the osteoporosis-producing action of starvation due to the animal's loss of appetite. The increased number of osteoclasts is apparently caused by the destruction of the bone for the purpose of providing the organism with a source of energy during starvation. The possibility of the existence of compensatory mechanisms capable of replacing vitamin A to a certain extent, and their degree of development in different individuals, the varying power of resistance of the organism, its predisposition to disturbances of calcium metabolism, or, on the other hand, to disturbances in the growth of tissues, the presence of conditions which, apart from vitamin A, are capable of producing osteoporosis—all these factors, apparently, decide the question as to the principal character of the changes of the skeleton on a diet deficient in the antirachitic organic factor. The nutrition of the mother during lactation also strongly influences the power of resistance to rickets or the reverse in the offspring.

There is one more question to be touched on—namely, why in some cases a picture typical of rachitis tarda or osteomalacia is observed in the skeleton—that is to say, why, with an abnormal and sometimes very large amount of osteoid, there is an absence or only a slight development of changes in the cartilage typical of rickets (the proliferating cartilage being sometimes even diminished). The conclusions which may be drawn from my experiments are as follows: Rickets was produced in rats, provided the age was not greater than 3 to 6 weeks at the beginning of special feeding. When the special feeding was started at the age of about 2 months a picture characteristic of late rickets or osteomalacia resulted—namely, the changes in proliferating cartilage were not well marked. In rats at the age of 3 months or older, if a rickets-producing diet is administered for about three months the changes occurring in the skeleton are either insignificant or show signs of mild late rickets or osteomalacia. Therefore my experiments corroborate the view that there is no essential distinction between rickets and osteomalacia, the only modifying influence being age.

Summarizing what I have said about the effect on the skeleton of the diet used by me, containing minimal adequate amount of calcium and deficient in the so-called vitamin A, I consider it possible to draw the following conclusions:

1. The action of vitamin A on the skeleton is the result of the combined action of several factors, only some of which are known at present.
2. The primary and highly important function of vitamin A consists in its property of controlling the normal deposition of lime salts in the bone, and therefore normal calcium metabolism.
3. The second, and quite as important, function of vitamin A is its property of controlling growth and apparently the normal nutrition of tissues, the osseochondral in particular.
4. The third property of vitamin A is its power of inducing a normal state of appetite.
5. In my experiments on rats the elimination of the first function of vitamin A from the organism results in the development of rachitic affections of the skeleton; of the second and third in osteoporosis of the skeleton.
6. As a result, therefore, when the diet is deficient in vitamin A these three functions are eliminated simultaneously, and the experimental rickets produced exclusively by this deficiency alone is associated with a more or less severe osteoporosis.
7. The absence or only slight development of osteoporosis in rickets produced by a deficiency of vitamin A in the diet might occur under the following conditions:

(*a*) When the deficiency of vitamin A, while not greatly undermining the general nutrition of the organism, is sufficient to affect calcium metabolism. Apparently, for the production of rickets in this case, it is necessary to increase the effect of such a small deficiency of vitamin A by the action of other factors which likewise disturb the calcium metabolism (for example, calcium or phosphorus starvation). Apparently such a method of the development of rickets is the most probable (but in my opinion not the only) one in the origin of human rickets.

(*b*) When the organism contains well-developed compensatory mechanisms capable of replacing (if only to a certain extent) the second and third functions of vitamin A.

8. The deficiency of diet of the mother in vitamin A results in a marked aggravation of the skeletal disorders of the offspring kept on a diet similarly deficient.
9. The state of nourishment of the mother during pregnancy, and especially during lactation, is one of the most important conditions of the normal development of the skeleton of the offspring.

In the etiology of rickets and osteomalacia, the factors undoubtedly playing a great part in the origin of these diseases are deficiency in the diet of vitamin A (or of an organic factor closely connected with it), calcium, and phosphorus, or a disproportionate balance of the last two. Confinement, in the sense of insufficiency of light, fresh air, and muscular exercise, apparently also plays its part (the majority of the data in agreement with each other being in favour of the importance of light, particularly of ultra-violet rays). Therefore, apparently, rickets can be caused by any one of these etiological factors or by any combination of them. From this point of view there are several forms of rickets, which should be classified from an etiological standpoint.

Dr. Douglas Galbraith (Glasgow) said: With regard to the question of diet in rickets, I should like to give briefly the results of an investigation I have been carrying on for over a year now at the Royal Hospital for Sick Children, Glasgow, under the guidance of Dr. Leonard Findlay. The chief object of this was to test the dietetic theory of etiology, with special reference to the fat consumption. The method adopted was to observe babies for long periods on definitely prescribed diets—fat-rich and fat-poor—and to note the incidence of rickets in the two groups.

The babies, some of whom were only a few weeks old when

they came under observation, were seen frequently, weight charts kept, clinical notes made, and the children radiographed regularly. The mothers all had written instructions of the diet, and were questioned frequently, so that, although the children were not under direct observation as indoor cases as in the experiments described by Miss Chick, one could be fairly sure that the diets prescribed were being actually given. All those cases in which there was the slightest doubt were discarded. For a fat-sufficient diet undiluted cow's milk in sufficient quantities was given up to ten months, and after that a general diet with milk, butter, soup, and gravy. The deficient diets were composed of milk mixtures containing 1 per cent., 1.5 per cent., and 2 per cent. fat. The diagnosis of rickets was never made unless the clinical findings were substantiated by a positive radiographic picture. In many cases the clinical signs were few, although the radiographic evidence was definite. The following table shows the results:

Analysis of Results (83 Children Observed).

Number of Children Observed.	Fat.	Nature of Feeding.	Number Developing Rickets.	Percentage Developing Rickets.	Percentage Developing Moderately Severe or Severe Rickets.
In Winter:					
24	Sufficient	Artificial	21	87	66
17	Deficient	Artificial	12	70	41
18	Sufficient	Breast	13	72	44
4	Deficient	Breast	3	75	25
In Summer:					
8	Sufficient	Artificial	1	12	0
12	Deficient	Artificial	3	25	0

It will be seen that of 63 children observed during the winter months 77 per cent. developed rickets, and the percentage in the fat-sufficient group is slightly higher than in the fat-poor. Furthermore, the degree of rickets is rather more severe in the children on a fat-sufficient diet than in those on a fat-poor diet. This experiment differs principally from those described by Miss Chick in that an ordinary fat-sufficient diet was given, whereas she added cod-liver oil to a similar diet. It is possible that the difference in results is attributable to some constituent of cod-liver oil other than the fat-soluble vitamin. In the summer months the number of cases observed was smaller. The incidence of rickets was low, and the degree was slight in each case.

My conclusions are as follows: (1) Children on a definitely fat sufficient diet developed rickets during the winter months. (2) The degree of rickets in children on fat-poor diets was no more severe than in those on sufficient diets. (3) Children on fat-poor diets remained free from rickets.

Dr. J. Sim Wallace (late Lecturer on Dental Surgery and Pathology, London Hospital) said: Ideas with regard to the causation of rickets have recently been considerably influenced by the supposition that fat-soluble A played an important rôle in the development of the teeth. That lack of this vitamin cannot now be regarded as the cause of rickets is generally admitted; nevertheless the authors of the theory that absence of fat-soluble A causes dental hypoplasia have not stated clearly that they have now completely abandoned this idea. In a recent communication Mrs. Mellanby admits that there are "certainly" other causes of hypoplasia, but we want to know whether lack of fat-soluble A in the diet can be supposed to cause hypoplasia as frequently as does measles or scarlet fever, or for that matter any other single disease which may affect the life history of the amyloblasts or other epithelial cells.

The experiments and suppositions on which the vitamin theory rested never misled those who were well acquainted with the facts concerning the development of the teeth, but they certainly seemed to impress many outside the dental profession.

It may seem to enhance the importance of vitamins to imbue them with marvellous powers. If it is possible to depict an abject animal *in extremis*, and then with the aid of minute doses of the required vitamin rejuvenate the animal as if by magic, then of course a sensational impression is made. Such results may well be true with regard to beri-beri and other deficiency diseases, but the attempt to claim that totally different diseases are preventable or curable in a similar way seems hardly justifiable. We have been rather regaled with "the importance of the infinitely little" when the wonderful powers of a vitamin are to be shown on a graph or a screen; but when it is pointed out that children in these days are apparently more richly fed with regard to fat-soluble A than in past ages, it is openly proclaimed that an *abundant supply* of this vitamin is necessary, and something containing 250 times the fat-soluble A found in milk or butter is recommended to save our children from rickets, and the teeth from hypoplasia and dental caries. Even then clinicians often fail to note the marvellous effects claimed without a properly balanced diet, sunlight, and general hygienic conditions. Again, it may be possible to deprive puppies of calcium, phosphorus, and substances necessary for their metabolism in a laboratory so completely that the development of the teeth may be interfered with: but is there any evidence that this ever occurs among children so long as they are getting even a bare sufficiency of protein under any existing scheme of dietary, however eccentric it may be? The quantity of protein and the other ordinary constituents of the diet is massive; the quantity of fat-soluble A, if it be a vitamin, is negligible, for, as is generally recognized and as has been explicitly stated by Professor Halliburton, "the quantity of vitamin necessary in the diet is infinitely small."[1]

In recent years dental examinations of multitudes of school children have been made, and one of the generalizations resulting from such examinations is that "the better the school the worse the teeth," which rather confirms the view, long held by dentists, that dental caries is not a deficiency disease; rather is it a luxury disease, depending upon the stagnation of easily fermentable and generally expensive carbohydrates.

But can we even regard the actual experiments which have been made on puppies as serious scientific evidence that lack of fat-soluble A produces dental hypoplasia? It was claimed that the special feeding of puppies had caused not only rickets but also dental hypoplasia. One might have thought that the first thing any competent experimentalist would have made sure of was that the hypoplasia had not been produced by other causes before the experiments with special feeding were commenced. Anyone acquainted with the development of enamel who is presented with a tooth showing a developmental defect is immediately interested in the conditions during, if not antecedent to, the formation of such enamel—that is to say, to conditions existing long before the eruption of the tooth. We have always recognized that rickets delays the eruption of the teeth. The specimens shown in the experiments referred to were from rickety puppies, so that presumably the eruption of the teeth had been retarded some weeks if not for some months. Now the enamel of the crown of a tooth is completely formed long before its eruption even in a non-rachitic subject. Consider the first permanent molar. In the human subject the tips of the cusps commence to calcify at or even before birth, and dentists recognize that hypoplasia of the cusps of these teeth is associated with pathological disturbance at a corresponding age. The rest of the enamel of the crown is then gradually formed, and the crown is complete when the child is 2 years of age. But I want you specially to note that this tooth erupts four years later—that is, at the age of 6. Special feeding or anything else that happens to the child between the age of 2 and 6 has therefore no relation to hypoplasia of the crown of this tooth. Although the formation of the enamel in the first molar of a dog commences just before birth, growth being much more rapid than in the human subject, it is possible that the interval between the formation of the enamel and the completion of the eruption of the first molar in the dog may not amount to more than five or six months, or to seven or eight months when rickets is present. But it appears to have been during the three to six months immediately preceding the completion of eruption of the puppies' teeth that the special feeding which was supposed to produce the hypoplasia took place. In other words, to put it briefly, the hypoplasia existed for a month or two before the rickety feeding experiments were commenced. The only evidence of any attempt to correlate the effects of the feeding and the dental hypoplasia may perhaps be found in a statement by Mrs. Mellanby that "at intervals *x*-ray photographs were taken of the teeth developing in the jaws. This is not an easy matter in puppies and my results are not so successful

[1] British Medical Journal, June 18th, 1921.

as they ought to be." Much stress was laid on so-called "facts," but when we investigate the facts we find that they are simply unjustifiable and misleading inferences.

Here let me refer to something of an amusing nature. In some of the exhibition specimens showing hypoplasia in the teeth of puppies, which was claimed to have resulted from the absence of fat-soluble A in the diet, the lower part of the crowns of the first molar teeth—that is, the part nearest the neck of the teeth—had good enamel, although between this and the tip of the crown the enamel was hypoplastic. Now, if any part of the enamel was formed during the special feeding it must have been the part last formed—that is, the part at the neck of the tooth, because immediately the experiments were finished the jaws were treated with formalin and then preserved. Obviously, therefore, lack of fat-soluble A had cured the hypoplasia, if it did anything at all. We need not follow Professor Mellanby to Skye in his endeavours to associate the state of the teeth with fat-soluble A. His own laboratory shows us clearly all that is required to disprove his contentions.

The possible association of dental hypoplasia, rickets, and dental caries was investigated years ago by reliable observers in the medical and dental professions—not with regard to what happens in dogs, but with regard to children, which is more important, for it is this that we want to know about. Dr. G. A. Carpenter and Mr. Denison Pedley found that in rickety children there is as a rule no deficiency of enamel,[2] and further, the latter authority, as the result of a subsequent examination of 500 boys and girls in the Evelina Hospital for Sick Children found that "there is no evidence to prove that caries is more frequent among rick ty children than among those who are suffering from other diseases."[3] Mr. Norman Bennett in a later investigation[4] arrived at similar conclusions. He corroborated the views of previous observers, who attributed dental hypoplasia to certain diseases, such as measles, scarlet fever, whooping-cough, syphilis, dysentery, and digestive derangements not necessarily associated with rickets. Other investigators have made similar investigations and come to similar conclusions. But even though it were shown statistically that dental caries was more prevalent in children afflicted with rickets, this would not show that rickets causes or predisposes to caries. It would only corroborate what most of us believe, that excess of carbohydrate in the diet is an element in the causation of both diseases.

Consider the subject from another point of view. Hypoplasia is a very rare occurrence in the temporary dentition; and this has long been recognized by the dental profession. Recently Dr. A. T. Pitts found as a result of an examination of 5,000 temporary teeth that only about one-half per cent. were affected with hypoplasia. Yet caries is even more rampant in children's first teeth than it is in the teeth of adults, and for this reason I shall limit my concluding remarks to hypoplasia as it affects the temporary teeth. It is admitted that when hypoplasia affects teeth it is as a rule caused by other diseases than rickets; so we may say that although one tooth in 200 temporary teeth is affected with hypoplasia, only one tooth in 1,000 is affected with hypoplasia as a result of rickets. But rickets is now recognized to result from causes other than lack of fat-soluble A in the diet, at least as a very general rule. Let us suppose, however, that in 10 per cent. of cases lack of fat-soluble A causes or helps to cause the rickets, and we arrive at the conclusion that one tooth in 10,000 is affected with hypoplasia as a result of lack of fat-soluble A in the diet. Lastly, we must remember that hypoplastic teeth do not by any means always become carious. Though hypoplasia may and sometimes does predispose to focal carbohydrate stasis and consequently to caries, it does not always do so. Indeed, what strikes dentists most with regard to hypoplastic teeth is their ability to withstand the onset and progress of the disease, and medical men must have noted that the grossly hypoplastic Hutchinson's teeth are almost always free from caries.

So to sum up and keep to round numbers we may say that lack of fat-soluble A in the diet of children may be assumed to account for one carious tooth in 100,000.

It should nevertheless always be remembered that dental caries is a disease found as a matter of fact most abundantly among children who are fed with foods rich in fat-soluble A, and the sooner those who belabour "the importance of the infinitely little" learn to appreciate some sense of proportion the better for the rising generation.

[2] *Lancet*, May 14th, 1892, p. 1077.
[3] *The Hygiene of the Mouth.*
[4] *Trans. Ophthal. Soc.*, 1901.

Major H. S. HUTCHISON, I.M.S., said: I wish to bring to your notice very briefly certain observations on dental caries in the Nasik and surrounding districts of the Bombay Deccan which I made just before leaving India last year. These observations are, I think, of some interest, not only from the point of view of the geographical distribution of the condition but also with reference to the occurrence of rickets in the Nasik district and to the dietary eaten therein. For the purpose of the present observations the Indians were divided into the same three classes as in my rickets inquiry—namely, (1) Mohammedans, (2) well-to-do Hindus, and (3) poor or lower-caste Hindus. Suffice it to say that the first two classes eat a dietary containing a fair amount of animal fat, about 35 grams on an average, while the third class eats only about 3 grams and at the same time consumes a much larger quantity of carbohydrates.

As a result of this inquiry it was found: (1) The number of teeth present per individual at all ages up to 40 is high, and that the percentage of caries present is very small. (2) There is practically no difference between the various classes as regards the amount of caries. It is evident that the poor diet of Class 3 has had little effect in producing caries. (3) The percentage of individuals without caries is high in all classes and certainly no less amongst the poor. We see then that the fat-poor dietary of the poorer classes has not led to the increase in dental caries which one would expect. I may say that in several cases I have seen the incisor teeth so ground down on their anterior surface that the central canal was visible in nearly its whole length, and that this was not accompanied by any caries. The incidence of dental caries bears no relationship to the occurrence of rickets. In Nasik I found rickets to be a disease of the well-to-do and not of the poor. The slide shows that caries is uncommon in all classes, and yet rickets is six times as common in the well-to-do, while this class eats a much better dietary.

I would like in conclusion to say that I cannot agree with Professor Mellanby in his statement that the general activity of the child depends almost entirely on its diet and not on its environment. If such were the case, judging from the dietary, the poor Indian children should be listless and rachitic, whereas my experience has been that they resemble Professor Paton's country pups in being strong sturdy specimens without a suspicion of rickets. Certainly this explanation of Professor Mellanby cannot explain the rarity of rickets among the poor Indians and its frequency among the much better fed rich, and it is totally insufficient for the cases of late rickets, which in Nasik is practically unknown among the poor. In considering the etiology of rickets the geographical distribution must be taken into account.

Dr. J. B. ORR (Rowett Institute, Aberdeen) said: I desire to deal with the importance of the mineral content of the diet. The characteristic feature of rickets is a disturbance of the mineral metabolism of the body. In the production of experimental rickets, therefore, until it is determined that the mineral matter of the diet is adjusted to the mineral requirements of the animal, it is premature to discuss the importance of any other dietary factor. Obviously the diet must contain all the essential minerals in sufficient amounts. Almost as important as the amount is the proportions in which they are present. The results of metabolic experiments which we have carried out show that the percentage utilization of calcium depends to some extent on the calcium-phosphorus ratio in the diet. It is not merely a question of there being a sufficiency of phosphorus. Ingle showed, years ago, that rickets in horses could be produced by a diet with an overwhelming excess of phosphorus. An excess of potassium interferes with the retention of calcium and a lack of proportion between sodium and potassium has been shown by Zuntz to produce a definite pathological condition. Associated with this lack of balance is the influence of the form and combination in which the minerals are present. Even when dealing with such closely related foods as milks of different species, as has been shown by Ufflemann, a growing animal can utilize a higher percentage of the calcium of the milk of its own species than of the milk of a different species. In the investigation of any dietary factor, therefore, unless the experimental ration contains all the essential minerals in the amounts and in the proportions that they are required, and in a form that they can be utilized, the result with regard to any other dietary factor is bound to be confused. In Mellanby's experiment on puppies, rickets developed on various diets consisting of rice, white bread, oatmeal, and from 170 to

250 c.cm. of milk. In these diets the only constituent that contains a substantial amount of calcium is the milk. On Mellanby's ration it is impossible for the puppies to get more than 0.4 to 0.5 gram of calcium a day, whereas Voit has shown that a young dog of 3 to 4 kilos requires 0.5 to 0.7 gram of calcium a day, so that the diet contained an absolute deficiency of calcium. Further, in rice and white bread the small amount of mineral matter consists largely of phosphorus. The ratio of calcium to phosphorus is about 1 to 10, whereas in fresh milk it is roughly about 1 to 1. It is impossible to draw definite conclusions with regard to the influence of any other dietary factors on such rations, which are so deficient both in amount and in balance of mineral matter. Mellanby's experiments were repeated on pigs at the Rowett Institute, Aberdeen. Well-marked rickets developed in from thirty to forty days, but on the same rations with the mineral water adjusted by the addition of inorganic salts to make the amount sufficient, and the proportion of the different minerals resemble those obtaining in sow's milk, pigs from the same litter showed normal growth and perfect health. In other pig experiments it was found that when the mineral matter was properly adjusted no rickets developed on a diet of oatmeal, oats, and bran continued from the period of weaning at nine weeks until the animals were sexually mature. On the other hand on the same diet, without mineral adjustment, rickets developed even if cod-liver oil were given in amounts from 10 to 60 c.cm. a day. Cod-liver oil has certainly some prophylactic value, and its influence is probably due to its effect in increasing the percentage assimilation of calcium or other minerals in a diet in which these are deficient. In these experiments on pigs and other animals we found that the closer the mineral content of the diet approximates to the requirement of the animal the less the influence of cod-liver oil. With regard to the relative importance of fat-soluble A and the proper amount and balance of minerals, there seems no doubt that the latter is the more important dietary factor so far as the production of rickets is concerned. All that has been said with regard to the evil effects of cereals and other carbohydrate-rich food can be explained on the ground of their poverty in minerals and the improper ratio in which these are present, and the curative effect of Mellanby diets, which contain such large quantities of milk and egg, can be ascribed as much to the mineral matter of them as to the hypothetical fat-soluble A. The field in which information is most required is that of mineral metabolism. The work in this field is tedious, laborious, and unsensational, but it is likely to be as productive of definite and permanent results as the pursuit of the elusive vitamin.

Dr. Walter Elliot, M.P., said: To-day's discussion shows very clearly how easy it becomes to concentrate on one part of a problem to the exclusion of the whole. When, for instance, Dr. Leonard Findlay concentrates on the probability of a microbic infection as the cause of rickets to the extent of denying altogether the influence of diet, it seems a position which cannot be maintained in view of the fact that rickets can be produced by an experimental diet in the dog (Mellanby), the rat (Korenchevsky), and by Dr. Orr and myself in both pigs and sheep. In any remarks which I have to offer I cannot speak first hand from the point of view of the clinician but only from that of the experimentalist. Nevertheless we must admit that everything we say must in the long run be subject to the verdict of the clinician. The results of experimental work, however, seem to point clearly towards diet as a very important factor in the onset of this condition, and to this extent I find myself in agreement with Dr. Mellanby. The particular food substance or quality governing the onset of rickets is a much more debatable point. It has been pointed out by the previous speaker that not only the quantities of mineral supplied but their ratio must be taken into account. This requires the greatest possible emphasis. Unknown bodies must not be postulated till complete allowance has been made for the known. For instance, minerals are supplied by Mellanby in one series of experiments in a "salt mixture" consisting of common salt only. McCollum, on the other hand, using a salt mixture based upon the ash of cow's milk, gives at least nine elements—sodium, chlorine, magnesium, sulphur, phosphorus, potassium, calcium, iron, and iodine. It seems here that the obsession with the presence or absence of "fat-soluble A" has led Mellanby to a neglect of other necessary requirements of the body. Similarly, great theories have been based upon experimental work on rats. In Korenchevsky's striking work he uses as a basal diet a food with a salt mixture similar to that of McCollum. But this salt mixture follows the ash composition of cow's milk. There is not a single accurate figure upon rat's milk in existence—quantity, fat content, ash, are all alike unknown. Again, the remarks of other speakers upon confinement as a dominant factor ignore the fact that Korenchevsky found this to have no influence on rats. I also have found in work upon sheep that animals ranging freely in the open upon a natural diet could develop the illness. As a matter of fact, it is only during personal experimental work that one realizes how rough and ready is all the research upon mineral metabolism. Mineral substances are usually administered in a mixture corresponding to the ash of cow's milk. It is a pure assumption that they are here found in the state most suitable for assimilation by a young animal of this or another species. More facts on mineral metabolism are urgently required.

Dr. Leonard Findlay, in reply, said that the discussion had been very important from both the academic and the practical points of view. He had limited himself to the clinical field. Changes which occurred in the rat and the dog did not necessarily happen in the child. Ossification of bone could be modified in many ways by experimenting with calcium, phosphorus, fat, etc., but a deficiency of any of these substances did not cause rickets. The fact that there were so many conflicting experiments showed that diet had nothing to do with it. If there were a combination of dietetic causes why did rickets occur only in the poorer classes? We should get away from the idea of lack of something. He disagreed with Dr. Hutchison that rickets could not be an infection. He congratulated Dr. Mellanby on his clinical results. He himself was not so successful. Anybody, however, could cure rickets in summer. He disagreed with Dr. Mellanby on the question of exercise. Babies were in the habit of exercising themselves all day. The cause of rickets was as yet undiscovered. We might be able to disprove Cheadle's statements, but we could not put anything in their place.

DISCUSSION ON THE TREATMENT OF TUBERCULOSIS OF THE CERVICAL GLANDS.

OPENING PAPER

BY

JOHN FRASER, M.C., M.D., F.R.C.S.Edin.

I am glad that those who are responsible for drawing up the programme of the meeting have chosen this subject for discussion. The disease (at least in certain localities) is so frequent that its efficient treatment must be of interest and importance to the practitioner, and yet, in connexion with this all too common condition, though an enormous amount of literature has accumulated around the subject, there is no definite unanimity of opinion regarding the most efficacious methods of treatment. Too often the literature represents the extremes of opinion, and one looks in vain for some moderate view, that being the one which is generally acceptable to the majority. It seems to me that at a meeting of this description—one representing all shades of opinion and varieties of interest—it should surely be possible to formulate a group of common-sense rules which will guide the practitioner in his advice to his patient.

There are few subjects which show such a wide divergence of opinion. There are many men with experience in this branch of work, for whose opinion one has the greatest respect, who believe that it is incorrect ever to advise operation in a case of tuberculous cervical adenitis; on the other hand, there are physicians and surgeons of repute who advise operation in every instance, irrespective of the condition of the gland or the type of tuberculous disease with which it is affected. Again, those who advise operative interference differ widely in their ideas regarding the type of operation to be adopted. To some, operation means incision and curetting, to others it infers a complete removal of the cervical glands inclusive of and in the neighbourhood of the affected area, and there are a few who would be content with drainage of a tuberculous abscess when such develops. Someone must be in error, and it should surely be possible to formulate a definite scheme by following which one may be assured that one is doing the best possible for one's patients.

Personally I rather pride myself that I do not hold any extreme view—when I have finished this paper you may not agree with me—but I teach the student (the practitioner of to-morrow) that a moderate view is the correct one, a view which believes that under certain conditions there is a very definite place for conservative treatment, while in other circumstances there should be no hesitation in advising radical operative interference. The essential is to know when to advise the various types of treatment, and, further, to explain the reason for your choice to intelligent parents or patients.

Perhaps I ought to give some guarantee for the opinions which I express; the guarantee is based upon some 2,000 gland cases, for the treatment of which I have been responsible during the past ten years.

I do not intend to trouble you with any detailed account of the disease; my intention is to express my views upon treatment; but, as a rational treatment must essentially be based on factors of etiology and pathology, there are certain points in the clinico-pathological history of the disease which I wish to bring forward. I do so because these several factors seem to me to be the essential items upon which a logical and successful treatment must be based.

I.—*A Distinction between Blood and Lymphatic Modes of Infection.*

This is one of the points upon which my later argument is based, and therefore I desire to be definite. I wish to distinguish clearly between glands which have been infected with tuberculosis via the blood stream and those which have become diseased by a lymphatic spread from a local focus of infection. The question may be asked, How is one to distinguish between these two modes of infection? I know of two methods, one clinical and one pathological.

The clinical test depends upon the distribution of the diseased glands: a scattered, haphazard, and often coincident appearance of multiple diseased glands in areas unconnected by lymphatic vessels suggests a blood infection, while the local development of a tuberculous gland, the disease remaining for a time localized to that gland or its immediate neighbourhood and afterwards spreading to actually adjacent glands, suggests a lymphatic infection, more especially if the affected glands lie in lymphatic connexion with such an obvious area of absorption as the tonsil.

Pathologically there is a test which one is able to demonstrate at operation, but, being dependent on morbid anatomy, it is not of value from the clinical pre-operative standard. I may be permitted, however, to mention the detail. If two tuberculous glands in early stages of the disease are cut in longitudinal section, one being the result of a blood infection, the other due to a lymphatic spread, it is possible to distinguish between them, because in the case of the blood infection the early disease is central, while in the lymphatic spread the disease is distributed as groups of follicles around the periphery close underneath the capsule, in what may be termed the "corridor of the gland."

Of the two possible methods of gland infection—(*a*) by blood stream, (*b*) by lymphatic stream—it is correct to state that where the cervical disease of children is concerned a figure of over 90 per cent. represents the proportion of occurrence of the lymphatic infection. I believe that it is of primary importance to draw this distinction, and my subsequent remarks may be taken as applying to the common variety—the tuberculous gland which is the result of a lymphatic spread from a local area of absorption.

II.—*The Proportional Distribution of the Gland Groups Affected.*

In my experience the distribution of occurrence of the lymphatic variety is somewhat as follows:

Locus of Absorption.	Glands Affected.	Percentage Proportion.
Faucial tonsil	Jugulo-digastric group	80
Naso-pharyngeal adenoids ...	Post-carotid group	12
Carious teeth	Submaxillary group	8

There is a small percentage of cases which has not been included in this grouping—the cases in which the cervical disease is first noticed in the supraclavicular region. The majority of these are examples of a spread from the mediastinal or bronchial glands. The occurrence of the variety is so rare in children, however, that I have not included it.

III.—*The Lymphatic Type of Cervical Glandular Tuberculosis is for a Time a Local Manifestation of a Local Infection.*

In many children the enlarged tuberculous gland is the first macroscopic evidence of the disease. The organisms have gained entrance through tonsils, adenoids, or carious teeth; they have extended by the lymphatics to the nearest group of lymphatic glands; they have become arrested in the lymphatic network of the gland, and it is their presence in the gland over a certain period of time which results in tuberculous adenitis. Now if you consider the position for a moment you will realize the importance of this sequence of events. From a local area of absorption there is a local manifestation of the disease, and for a certain period of time—the exact length of which we cannot at present define—the disease remains a local manifestation, an intraglandular tuberculosis. A parallel to this is not common in pathology. Where tuberculosis is concerned a somewhat similar condition is observed when the pathologist's wart develops, and there is a resulting infection of the epitrochlear and axillary glands, but in every other variety of tuberculosis the sequence is different. Therefore, at the risk of reiteration, I wish to insist upon this point—that in many cases cervical glandular tuberculosis is a local manifestation of a local absorption, and the glandular disease remains for a time the only manifestation of the disease apart from such infection as may exist in the area when the absorption occurred or in the lymphatics which conducted the disease.

IV.—*Cervical Glandular Tuberculosis of the Lymphatic Type is Unassociated in its Early Stages with a Blood Infection.*

There is a point in the teaching repertory of Sir Robert Philip which has always impressed me: it is the insistence he lays on the fact that tuberculosis is a systemic disease, and when he uses the term "systemic" I presume he means that the disease is essentially a general one with local manifestations at selected points. In many cases this is undoubtedly the correct view to take of the disease. Pulmonary tuberculosis in its various forms is invariably associated with a blood infection before it comes under the notice of the physician; bone and joint tuberculosis must of necessity be accompanied by a tuberculous septicaemia, because the foci are the local manifestations of a general infection; tabes mesenterica and tuberculous peritonitis are accompanied by a generalized infection before they become sufficiently definite to attract clinical attention; but in the cervical glandular tuberculosis of children—in the tuberculosis, for example, of the tonsillar or jugulo-digastric group which forms 80 per cent. of the cervical disease—we have an outstanding peculiarity: the disease remains for a certain period unaccompanied by a general infection; there is tuberculosis of the lymphatic gland or glands without the accompaniment of a haemic involvement. The actual period of time which elapses between the original development of the disease in the gland and the involvement of the blood stream is probably considerable.

V.—*Tuberculous Cervical Adenitis is in its Early Stages a Purely Tuberculous Infection.*

I am not sure that we fully appreciate the importance of this fact, but the reality is brought out when we contrast cervical glandular tuberculosis with pulmonary tuberculosis. In the latter a mixed organismal infection is present early in the disease, and probably many of the general symptoms are originated and aggravated by the mixed infection. But in glandular tuberculosis, and especially in cervical glandular tuberculosis, the infection remains purely tuberculous except under two conditions—unwise operative interference, and the periodic attacks of subacute lymphadenitis and periadenitis, to which I shall allude later.

VI.—*The Pathological Changes which a Tuberculous Lymphatic Gland Undergoes.*

From what we have seen of the disease we recognize three pathological types—the caseating, the lymphoid, and the fibrous. The caseating variety is the most common. I do not know in what proportion it occurs, but it must form a very large percentage of the whole. The caseating variety

passes through a distinct sequence of changes. An intraglandular tuberculosis develops. Intracapsular caseation occurs, and during this period the gland becomes subject to attacks of periadenitis, which are interesting in so far as they temporarily alter the clinical picture. The explanation of the periadenitis is probably a superadded pyogenic infection—an infection with which the gland could normally deal, but which, the gland being devitalized, with a proportion of its lymphoid tissue replaced by tuberculous disease, results in congestion, oedema, tenderness, and swelling of the affected gland. Periadenitis is generally the signal for the next stage of the sequence; the caseation appears to be stimulated by the superadded infection—it makes its way through the gland capsule, and the disease is now not only intraglandular, but there is, in addition, a periglandular tuberculous abscess. In a neglected case there are the later stages of subcutaneous abscess in addition to the periglandular and intraglandular foci, and, finally, a sinus or tuberculous ulcer of the overlying skin or mucous membrane.

The lymphatic type is comparatively uncommon; it is apt to be mistaken for Hodgkin's disease. There is little tendency to caseation except in the late stages of the disease, the glands remain discrete, and, unless caseation occurs, there is little tendency to periadenitis. This is a digression, and I shall allude to the point again; but I may say at this stage that, while the lymphoid type of disease is an easy one on which to operate, in so far as the glands separate readily, it is unsatisfactory in so far as recurrence is common unless definite precautions (to which I shall allude later) are taken.

Fibrous tuberculous adenitis is the least common type in children; in this respect it is distinctive from the adult disease, which is so often fibrous in character. The glands are small and hard, with usually some central caseation. From the surgical point of view it is an undesirable variety of the disease on account of the tendency which there is to form adhesions to surrounding parts.

VII.—*The Importance of the Bovine Bacillus as the Causative Factor of Glandular Tuberculosis.*

In Edinburgh two questions are repeatedly put to us:

> How do you explain the large proportion of cervical glandular tuberculosis with which you have to deal in contrast with other centres? and
>
> How do you account for the fact that a large proportion of the cases which you treat appear to be of a more severe and rapidly caseating type than that commonly met with in other centres?

It is rather difficult to give a definite answer to these two questions, but undoubtedly the answer to the first depends to some extent on the large proportion of cases which are due to an infection with the bovine type of bacillus. In 1912 and the succeeding years Mitchell reported a proportion of over 90 per cent. of the cervical glandular tuberculosis of children as being due to a bovine infection, and, though such a high proportion has been questioned, Wang later reported results which to some extent confirmed Mitchell's observations.

Such a high proportion of bovine infection can only mean unusual exposure to a milk infection, and it is possible that in this source we have the answer to the first question. That the question of the relatively high proportional occurrence of tuberculous glands in Edinburgh and district is a proper and pertinent one is clear; in the month of May, 1919, 82 new cases of cervical glandular tuberculosis came under my own observation.

If the second question is a correct one, I confess I find it difficult to know how it should be answered, unless it be that the answer to the first also explains the second—that a bovine glandular infection is more likely to run a subacute course with early caseation than a human infection. On this point, however, I have no reliable information.

VIII.—*Questions of Age and General Condition of the Patient.*

Under this heading there are one or two clinical points which I wish to consider. If children become infected with the disease in the first year of life my experience has been that almost invariably the disease makes rapid progress. There is an early tendency towards caseation and periadenitis, the disease rapidly spreads to a wide distribution, and comparatively early in the sequence there is an infection of the blood stream. With each successive year of life up to the time of puberty there is a gradually increasing resistance to the disease.

The other clinical detail is that certain types of glandular tuberculosis are associated with very distinct signs of a tuberculous toxaemia, while other types show little or no general symptoms. In one case there is a comparatively slight local disease, and yet the child is pale, listless, and anaemic, while in another case with a much more extensive local disease general symptoms are to all intents and purposes absent.

A Summary of the Clinico-Pathological Points which have a Bearing on Treatment.

I have made it clear that I have no intention of attempting a systematic description of the disease; instead I have indicated certain points which in my opinion have to be considered before a reasoned opinion can be given regarding the best method of treatment. I would therefore summarize the points as follows:

1. A distinction must be drawn between lymphatic and haemic modes of infection.
2. A lymphatic glandular tuberculosis is for a time the only manifestation of the disease, apart from infection which may exist at the site of absorption or in the connecting lymphatics.
3. A lymphatic glandular tuberculosis is not at first accompanied by a blood infection.
4. With the exception of operative interference and the complication of periadenitis glandular tuberculosis is a purely tuberculous infection.
5. There are the three pathological types of the disease—the common caseating, the lymphoid, and the fibrous—and each of these has characteristics which influence the question of operative interference.
6. A large proportion of glandular tuberculosis owes its occurrence to a bovine infection.
7. In children of 1 year and under glandular tuberculosis tends to run an acute course with early infection of the blood stream.
8. Certain children suffer greatly from a tuberculous toxaemia, while others, with possibly much more extensive local disease, show few or no general symptoms.

It is upon these facts that our ideas of treatment are based, and I shall endeavour to indicate to you what these views are.

The Lymphatic Type of Cervical Glandular Tuberculosis is a Preventable Disease.

This is a truth which can scarcely be insisted upon too frequently. You will notice that I distinctly state that the provision applies to the lymphatic variety, but even so, what does it mean if the lesson be efficiently learnt? It means possibly the exclusion of 90 per cent. of cervical glandular disease, and very likely a great diminution in the remaining 10 per cent. It is not for me to indicate efficient preventive measures, but I would mention two, and, if these were insisted upon, an improvement would result. They are the sterilization of every drop of milk which the child consumes until it reaches the age of 5 or 6 years, and the exercise of care that the child does not come into contact with a case of open tuberculosis. Insistence on the latter point should surely be a simple enough matter, yet it is extraordinary how blind parents may be to the possibility. Only the other day a child was brought to my notice suffering from extensive glandular tuberculosis. The child was accompanied by its mother and a nurse. The mother, who was apparently a sharp, intelligent woman, was exceedingly exercised about the explanation of the development of the disease. She was fully alive to the importance of milk sterilization, and she assured me that this precaution had been taken. I had meantime noticed that the child's nurse was wearing a small surgical dressing on her neck, and investigation showed that the girl had chronic glandular tuberculosis with a small discharging sinus. The child was subsequently operated on, and the bacteriologist reported that a human bacillus had been isolated from the child's infection. It is scarcely credible that such an obvious and preventable source of infection could have been overlooked, yet I assure you my report of the circumstances is correct, and a similar position, I have no doubt, frequently arises.

Have we Evidence that Glandular Tuberculosis can be completely Cured by Non-operative Remedial Measures?

I can imagine the storm of indignation which even the suggestion of a question of this kind will arouse; but none the less it is a fair and proper question to ask, and it is one upon which we have a right to expect demonstrative evidence on one side or the other. When I use the word "cure" I mean the complete disappearance of the disease from the gland. I do not mean encapsulation of the disease by fibrous tissue and a shrinkage of the hitherto enlarged gland.

You will agree with me that the question is a very vital one, and I do not know that we have any definite evidence to give in confirmation of the positive reply which I feel sure all of us would like to give. I can bring forward one or two facts which would seem to imply that many cases which we hoped were cured have been examples of localization and arrest of the disease, but not of cure in the sense which I have defined. During the later period of the war and the succeeding months there was a marked increase in the number of cases of glandular tuberculosis. I do not for a moment believe that such an increase was the result of greater exposure to infection; I believe that the cases responsible for the augmentation were those in which the disease had become arrested either spontaneously or through remedial means, and the lowering of vitality, combined with the diminished ingestion of animal fats which occurred at the period I have mentioned, led to a weakening of the encapsulating barriers and a recrudescence of the disease.

It is a matter of common knowledge how frequently one of the exanthemata is followed by the appearance of enlarged tuberculous cervical glands. It must very rarely happen that the tuberculous infection is successive to the non-tuberculous —it is rather the lighting up of a latent tuberculous infection, and I have observations of many cases in which conservative measures had been adopted with apparent cure, only to find a fresh and virulent recurrence of the disease after an attack of measles or whooping-cough.

The last point I bring forward, which makes me wonder if sometimes we are not too sanguine about cases of conservative cure, is one which is capable of direct demonstration. Sometimes it becomes necessary to operate upon cases which have had a prolonged course of conservative remedial measures. I have taken special pains to investigate each of these cases which has come under my observation, and in every instance I have succeeded in demonstrating live tubercle bacilli in the interior of the glands. I am fully alive to the antagonism which such a statement as this will arouse. I fully appreciate, also, that "one rose does not make a summer"; but "a straw shows which way the wind blows," and I have a suspicion that it would be well for us to investigate more fully the possibility of a complete conservative cure occurring.

You will appreciate what an important point this is. Am I to say to my patient, "Under favourable conditions it is possible for the disease to be completely eradicated by conservative measures," or am I only at liberty to say, "Under favourable conditions we can succeed in so isolating and circumscribing the disease that it will cease to be an actual menace to you, though you must be careful that at some future period a recrudescence does not occur"? I wish to make it clear that I am talking of the local disease, not of a blood infection; of the organisms which are locked up within a barrier of fibrous tissue, not of those which are circulating in the blood stream. I have no fear of the latter, but from what I have seen I am sometimes doubtful whether a tuberculous gland which has undergone caseation can be considered capable of complete cure by conservative means.

What is the Ideal Treatment of a Tuberculous Cervical Gland?

I suppose we must regretfully confess that we possess no direct and specific antibacterial agent for tuberculosis; our most successful remedies act by such means as focal reactions and stimulations of the body resistance. That being so, if the position of affairs is such as I believe it is in the lymphatic variety of cervical glandular tuberculosis, that from a local area of absorption there is a local and circumscribed glandular demonstration of the disease, in the absence of a specific remedy for that disease undoubtedly the ideal treatment consists in removal of the affected gland group, with a suitable elimination of the area through which the absorption occurred.

The position is that a bacterial poison for which at present we possess no direct remedy gains entrance into the lymphatics, and is for a time arrested in a definite group of lymphatic glands. If we recognize this position we must ask ourselves if we are really justified in adopting a conservative attitude, in saying, "The infection has gained entrance, but I propose to leave it *in situ* and to trust to the general resistance of the body and to certain local congestive means to overcome and to isolate the disease." Whichever method you choose, I think it is but fair in an early case of lymphatic tuberculosis to lay these possibilities before patients or their advisers. To my mind there is safety in the early operative removal, while the second possibility may involve enormous risk.

I know two arguments at least which will be advanced to contradict this line of early operation in the lymphatic type of the disease. It will be said that the glandular disease is so easily disseminated that to guarantee its complete removal is impossible. Those of us who have had an opportunity of operating upon a number of these cases know, however, that the disease is localized in its early stages, and remains so for a certain period of time. Another argument brought forward will be that operation is not justified at such an early stage of the disease, but the early operation in the lymphatic variety of the disease is the very basis of the ideal treatment.

I would express my creed in these words:

> I believe that where children are concerned 90 per cent. of cervical glandular tuberculosis is the result of a lymphatic spread from a local area of absorption.
>
> I believe that for a considerable time the disease remains limited to the gland or group of glands, and infection of the blood stream is a late complication.
>
> In view of the fact that we possess no specific antibacterial agent to overcome the tubercle bacillus, I believe that the wisest course is to remove completely the affected gland or group of glands before the disastrous complication of blood invasion or dissemination occurs.

Now, to these statements I wish to add one qualification, and it is an important one—it is relative to the question of operation. I believe that the whole success of surgical treatment in these cases depends upon the thoroughness with which the operation is performed. I am utterly opposed to the method of incision and scraping of the gland; it does not pretend to eradicate the disease, it increases the risk of dissemination by destroying limiting barriers, and sooner or later it ends in a secondary infection gaining entrance to the wound—in fact, it leads to each of the very complications which one is most anxious to avoid. It is this procedure of incomplete interference which has been responsible for the dissatisfaction with which operation is associated in the minds of many.

This is not the place to enter into a detailed account of the operation, but I would mention two facts in relation to it. Probably 80 per cent. and more of the cases call for removal of the jugulo-digastric group, and, as this group is in close lymphatic connexion with the posterior carotid chain, the operation is not a complete one unless this group too is removed. The removal must be radical and complete.

The second fact is this—out of interest in the subject I have looked over the figures of the operation cases for which I have been responsible. I have performed the operation of removal of the cervical glands on 1,428 occasions; as far as my knowledge goes, in seventeen of these cases minor secondary operation was necessary; the mortality was less than 1 per cent. In fact, it ranks as one of the most satisfactory surgical operations which we are called upon to perform. I can demonstrate, and will willingly do so at any time, hundreds of children who have been completely freed from the burden of tuberculous infection with all the risks it entails by a comparatively simple, early, complete surgical operation.

Such is one aspect of the problem, but there is another side about which we are just as definite. I believe that under certain conditions operative interference is strongly contraindicated, and, as this paper has already reached to a most inordinate length, I shall do no more than tabulate what I consider are the contraindications to operative treatment.

Contraindications to Operation.

1. If there is reason to believe that the glandular infection is a blood-borne one.
2. If the distribution of the glandular disease is haphazard and irregular, such a qualification being strongly suggestive of a blood infection.
3. I do not advise operation in the fibrous type of the disease.
4. It is inadvisable from every point of view to undertake operation in cases which have been previously treated by incision and curetting.
5. As a general rule I do not advise operation in the first year of life.

In addition to these, which I look upon as absolute contraindications, there are three qualifying statements:

(*a*) I never undertake any operative interference during the stage of periadenitis. I advise instead that the gland be fomented with a saturated solution of magnesium sulphate until all signs of the periadenitis have disappeared.

(*b*) In the lymphoid type of glandular tuberculosis I insist that, if operation is to be done, it must be followed by a series of exposures to *x*-ray therapy.

(*c*) If the child is suffering from a tuberculous toxaemia, I advise a short preliminary course of tuberculin prior to operation. I do so because my experience has been that immediate operation without this precaution is liable to be followed by a degree of shock quite out of keeping with the severity of the operation.

But, someone will say, you have omitted to mention the type of case which is the most common of all, the case in which there is a tuberculous abscess present, either intraglandular, periglandular, or subcutaneous. My answer is that, if the case does not otherwise come under any of the contraindication headings which I have mentioned, the presence of the abscess need make no difference. The incision is so planned that it does not pass through the skin immediately overlying the abscess; the abscess cavity can be evacuated without any fear of infection of the wound surface; the underlying glands are removed, and the abscess walls are sterilized with iodoform and bismuth paste. The postoperative results are as satisfactory as in an uncomplicated case.

I have purposely avoided any description of the conservative measures which are employed, but I may say that there are four procedures we favour—general hygienic treatment, the external application of Moro's ointment in its varying strengths, Béraneck's tuberculin internally, and in the lymphoid type of the disease *x*-ray therapy.

DISCUSSION.

The President (Sir Herbert Waterhouse) said that the thanks of the Section were due to Mr. Fraser for his clear and most interesting paper. He agreed with nearly every point that had been brought forward. He emphasized that tuberculosis of cervical glands was a local infection, and that the patient was cured if they were radically removed. He knew of no other cure. Recrudescence of the disease in glands that were considered free from infection was well shown in two of his cases. Some years ago two children with tuberculous glands came to his out-patient department. The mother declined operation. Rather to his surprise the glands subsided and became small and fibroid. Seven or eight years later, when the children were aged 14 and 15, they got measles. The glands became swollen, broke down, and suppurated. Those cases would have been reckoned as cures had he not chanced to see them again. He agreed with Mr. Fraser's three types of cases and also agreed in thinking that the fibroid and lymphatic types were best left alone. In the lymphatic type the operation had to be very extensive. A dissection from jaw to clavicle might be needed, and in a few months the glands would return and seemed to be as large as ever. There was one question he would like to ask Mr. Fraser. He could not understand the prevalence of bovine tuberculosis in Edinburgh. In London the human variety was relatively common. Could Mr. Fraser explain this? Another point he would like to bring forward was the effect of tuberculin treatment. For the last two or three years he had a growing conviction that with a bovine lesion human tuberculin gave the best results and vice versa. Of course it was difficult to demonstrate this, but he felt convinced that it was so. If he were asked, When was the best time to remove tuberculous glands he would reply, When they were freely movable, not when fixed by periadenitis. Operation should be performed early.

He wished to enter a protest against the use of *x* rays in the treatment of tuberculous glands. With enormous glands of the lymphatic type where operation was inadvisable they might do some good by reducing their size, but in the generality of cases he was totally opposed to their use. Of late, owing to *x* rays, excisions in private practice had become increasingly difficult. An enormous amount of fibrosis took place after many exposures and the glands became firmly bound down. He had never seen a cure by *x* rays, but had come across numberless cases where the removal of the glands was rendered a difficult or dangerous operation.

Mr. Grey Turner (Newcastle) said that he was sorry that he was called upon at this early stage of the proceedings because he was unable to differ from the previous speakers and so add variety to the discussion. He could only endorse what they had said. He was at one with Mr. Fraser with regard to the division and grouping of cases. The bad results so often seen after operation twenty years ago were due to the fact that no attempt was made at that time to differentiate between local and general disease. It was essential to recognize the local form and to realize that it might remain local for many years. He had a patient in which the disease had been present for forty years. It subsided for a time and then became active. The results of operation in these cases were very encouraging. With regard to general infection he did not consider that simultaneous enlargement of groups of glands—for instance, in the groin and the axilla—necessarily indicated a blood infection, but the disease was of a different type from cervical tuberculosis. We should not be too much influenced by pathological changes in the treatment of tuberculous glands. It was sometimes necessary to open and deal with an abscess. When there were a great number of glands with an abscess it was his practice to treat the abscess first and then remove the glands.

As regards the age of the patient it was his opinion that the majority of cases became infected very early in life, usually in the first year. The tubercle bacillus was seldom found in the tonsil in older children, but was present in a large proportion of the younger cases. He liked to operate in early life, even in children under 1 year of age. The operation was much easier to carry out, although there was a slightly greater risk.

Infection from milk was the chief cause of cervical tuberculosis. The disease was very prevalent in Newcastle, but had become much rarer in London. Local conditions certainly affected its incidence.

Evidence that tuberculous glands could be cured by means other than operation was very slender. The tubercle bacilli did not die, although the glands might become very much smaller. Their presence could be demonstrated years after the original infection. Could the disease be cured by surgical means? He thought that the after-history of a series of his cases showed that it could. It was true that his series was not a very large one, but it was notoriously difficult to follow up patients for periods of years. He had 83 cases which he had examined from five to eighteen years after operation. Of the 83 traced, 54 were quite well and 15 had one or two slightly enlarged glands, generally on the side opposite to that on which the operation had been done. Of the remainder, some had died of intercurrent disease and a few had contracted some other form of tuberculosis. He advocated operation in as early a stage as possible. There would then be very little scarring. In late cases a poor cosmetic effect was often unavoidable.

Mr. Alexander Mitchell (Aberdeen) congratulated Mr. Fraser on his paper. In Aberdeen there were a large number of cases of cervical gland tuberculosis. He thought the milk was responsible. In London the milk came from large dairies. Smaller places were supplied by small dairies where the cows were not regularly inspected. Mr. Fraser had laid emphasis on sterilization of milk as a preventive of tuberculosis, but some children did not thrive on sterilized milk. A better procedure would be to eliminate tuberculosis from the cows. The Government should have power to deal with tuberculous cattle. At present the tuberculin test to which cattle for export were subject militated against the eradication of the disease. A well-bred animal which reacted to the test and could not be exported was not destroyed but was sold in this country and was used for breeding, thereby disseminating the disease further. A large percentage of cases was associated with diseased tonsils and adenoids. Owing to the systematic removal of unhealthy tonsils which had followed the medical inspection of schools the incidence of tuberculous glands had been diminished considerably. In treating cases he attended first to any focus of infection and put it right if possible. He then exposed the patient to sunlight as far as possible for two or three weeks. If by then the glands had not subsided he operated. As a rule he removed the glands in one stage. All cases could be cured by complete dissection of the diseased glands, but the question was, Could any cases be cured by operation other than dissection? Curetting was a much less serious operation and left a smaller scar; in a few suitable cases he thought it was to be preferred. He did not agree with Mr. Fraser that dissection was inadvisable after curetting had been done. The operation might be more difficult, but where curetting had failed the patient was often not well until dissection had been carried out. The distinction between a blood and lymphatic infection might be true in theory, but in practice it was difficult to draw a hard and fast line between the two groups. In late cases many glands were enlarged, and it might be impossible to say where the disease had started.

Dr. HUGH THURSFIELD (London) said that he saw comparatively few cases of tuberculosis of cervical glands in London. They generally went to the surgeons. He thought that only when the cervical glands had infected the mediastinum did they hand the patient over. He wished to protest against the dangerous doctrine of bovine tuberculosis. He admitted that the bovine bacillus was responsible for many cases, but some were human. By too much insistence on the bovine source the human cases might be overlooked. There were ample opportunities among the poor for direct infection. He noted a clinical difference between the human and bovine cases. There were some children who had a small shotty type of gland, and in whom the disease pursued a malignant course. He thought that this type was more likely to be caused by the human bacillus. The infection spread to the mediastinum and to other organs. In infants it rapidly became generalized. Generalized tuberculosis associated with meningitis in infants of 2, 3, or 4 years, which had begun with cervical tuberculosis, was generally due to the human bacillus. It was interesting clinically to note that when the original illness was cervical the child had nearly always been in contact with a case of human tuberculosis. He was therefore loath to consider cervical tuberculosis as usually bovine. It was true, however, that London milk was a blend derived from many cows, and that tubercle bacilli were therefore likely to be scattered in many samples.

Mr. A. MACLENNAN (Glasgow) said that cervical tuberculosis was very prevalent in Glasgow. Early operation was not possible as a rule because there was not room in the Hospital for Sick Children to admit any but the severe cases. Government interference was urgently called for to deal with tuberculous cattle. The way in which milk was treated in all its stages on the way to the consumer was disgraceful. Under present conditions it was impossible to keep it from being anything but a culture medium. He gave an instance in point. When milk was sent by rail it was the carter's business to see that it was in proper condition when it arrived. The speaker had himself seen the carter plunge a grimy hand into each can and stir the milk round in order to ascertain this. The consumer when he received it usually treated it but little better. Cases of cervical tuberculosis generally began as a mixed infection. A case was brought with acute swelling of the neck. This subsided, but not altogether. Then, when resistance became lowered, as by an attack of measles, the glands would swell again. Tonsillitis or rhinitis was often the first trouble. The pyogenic organisms acted as carriers, and paved the way for the tubercle bacillus. It was impossible to make rules of correct procedure in treatment. Each individual case had to be treated on its merits. In the first place, the diagnosis had to be considered. It was not easy to distinguish blood infections from those that were purely lymphatic. Once caseation had occurred the infection would never disappear. He did not approve of *x* ray treatment. Operation should be performed in the majority of cases. The formation of an abscess was no contraindication.

[He then showed a series of lantern slides illustrating various types of cases and the effect of treatment.]

Mr. L. A. PARRY (Brighton) said that he thought that the prophylactic treatment of tuberculous cervical glands was very important. If the milk supply could be guaranteed free from tubercle, if the tonsils and adenoids of children could be treated, either by operation or otherwise, and if the teeth of children could have proper attention, then tuberculous cervical glands would almost disappear. He held the view that the majority of cases were of bovine infection and due to tuberculous milk rather than of human origin. Ten per cent. of all milk supplied in London contained living tubercle bacilli. The treatment, apart from general hygienic management, which was very important, in his opinion should be removal of any gland directly it was diagnosed definitely as tuberculous. He believed that all inflamed glands were potentially tuberculous. If a gland remained enlarged a month after any source of infection was removed—for example, large tonsils and adenoids, septic teeth, impetigo, etc.—then that gland was tuberculous and should be at once removed. Operation in the early stage was much simpler and much more certain than in a late stage, in which operation was sometimes very difficult.

Dr. A. A. WARDEN (Paris) pointed out that all the speakers had treated the subject exclusively from the surgical point of view, whereas he considered that Rollier of Leysin and Sir Henry Gauvain had shown conclusively that tuberculous disease of cervical glands was not a surgical affection and could be treated, in a large proportion of cases, on the general principles of heliotherapy. The problem was a social and economic one, and until tuberculous milk was banished treatment of the condition would be futile.

Mr. H. N. FLETCHER (Brighton) said that he thought no part of Mr. Fraser's paper was more valuable than that in which he insisted that, for some time, tuberculous disease of glands in the neck was a primary and local infection which should, whenever possible, be extirpated before it had the chance of spreading elsewhere. The last speaker had opposed operation, but had offered them nothing in its place except suggesting the adoption of the sunlight and open-air methods of Rollier and Gauvain. Heaven knew how much all of them longed for facilities such as theirs, but in most places there was no money to provide them at the present time.

As an old house-surgeon of Sir Harold Stiles, he was brought up in the faith of early and thorough excision of glands and had practised it for some years. Then for a time he had tried tuberculin injections and, if the glands broke down, aspiration, or incision, scraping, and sewing up where possible. The results of this were variable, and he determined to keep careful records of them, and did so for eighteen months. They were rather startling, and though the number was small (only 31 cases) they were worth recording, as we learnt more from comparative failure than from success. One case had the glands removed at an early stage. Of the other 30, every one broke down and suppurated sooner or later. Some came up for the first time with abscesses already formed, either under or superficial to the deep fascia; others broke down while under observation. In all cases aspirated the pus was submitted to culture, and in none were any complicating septic organisms found.

Aspiration.—Seventeen cases were repeatedly aspirated—in 6 there was eventually complete disappearance of all gland substance, and they were regarded as cured; 11 could not be so regarded in that there were some hard gland remains, which in 5 cases gave trouble subsequently.

Incision and Scraping.—Of 9 cases treated in this way, 1 was cured—that is, no remains; 8 had remains, 6 of which erupted later. The remaining 4 cases appeared for the first time with sinuses, 2 of which resulted in natural cure through discharge, and 2 had gland remains.

Of 26 cases, therefore, treated by aspiration or by scraping, only 7 were completely cured, and 11 of the incomplete cures caused further trouble within a few months.

This experience had sent him right back with renewed faith in early excision.

Aspiration certainly had its place in our methods of treatment, but it could never be wholly satisfactory. In not a few cases the caseating products were too thick to pass through even the largest needle. In other cases breaking down took place so rapidly that even frequent aspiration could not keep up with it. Again, it was a painful process which small patients dreaded. When it left hard remains it certainly gave a chance of fibrosis and perhaps cure, but there was often further breaking down later.

Until we possessed some more certain method of cure, such as, possibly, a more potent method of giving vaccines, he felt strongly that we should stick to early excision as the treatment of choice, reserving for aspiration and scraping those cases in which abscess formation has already occurred.

It was only fair to define what he meant by "early excision." There was the difficulty of deciding whether swollen glands were tuberculous or not. A sudden onset, rapid swelling, with some tenderness, were generally regarded as indicating a septic rather than a tuberculous origin. This was true of many cases, but it was surprising how many undoubtedly tuberculous glands start in this way also. If after due attention to tonsils and adenoid tissue, bad teeth, or otitis media the glands did not subside in two months, he thought they should be excised. In all cases he advised a six months' course of tuberculin in addition to general hygiene to raise the resistance of the patient.

Miss HERZFELD (Edinburgh), speaking as a disciple of Sir Harold Stiles and Mr. Fraser, said that she had investigated recently a hundred cases operated on by her in the surgical out-patient department of the Edinburgh Royal Hospital for Sick Children. With regard to the family history, 6 per cent. gave a history of tuberculosis; only 2 per

cent. of phthisis. This was in favour of bovine infection. The after history showed that one case had developed abdominal tuberculosis one year after operation; there had been no other complications. There had been one recurrence and two cases had developed glands on the opposite side of the neck. Out of 340 seen in two years 48 per cent. were apparently cured without operation. She did not use tuberculin or *x* rays.

Dr. Mackenzie (Manchuria) said that there was no bovine tuberculosis in Manchuria because the people did not drink milk. Infants who were not breast-fed generally died. They were given the same diet as their parents. Human tuberculosis was very prevalent. The population lived in huts with mud floors on which they expectorated freely, and nearly every dwelling was infected with tubercle. The cases of cervical tuberculosis that came to her hospital were generally girls in their teens with advanced disease. They came then because they had reached the marriageable age and had begun to trouble about their appearance. Cases in boys were less common, probably because they led a more outdoor life.

Dr. D. Smith thought that surgeons did not always see the first stage of cervical tuberculosis. This stage might not be tuberculous at all. The glands were primarily enlarged as the result of tonsillitis. He had removed and examined the tonsils in many of these cases and had found a streptococcal and sometimes a mixed infection. The tuberculous infection followed on this. With regard to operative measures, he had found aspiration of single glands, followed by injection of ether or other antiseptic, successful in 45 per cent. of cases where it had been tried. The infection ceased after six to ten injections. He did not believe in *x*-ray treatment.

SCOLIOSIS.*

BY

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Introduction.

The fascination of scoliosis is certainly not financial; personally I have become involved in the treatment because numerous cases have been sent to me from the educational clinic, and I have found that the disease has presented many problems more or less knotty. As a class I have found the children so afflicted perhaps more attractive than, say, those infected by the tubercle bacillus. In the hospital we have been forced to limit the number of tuberculous inmates as so long a time of residence is required before achieving any results. That this is a very cogent reason for selection is shown by the fact that though I have nearly 100 beds at my disposal there are usually about 200 on the waiting list.

To an audience such as this I need not refer to the history of the disease nor to its incidence, but I shall at once proceed to the consideration of the etiology.

The various ostensible causes may be referred to under the following heads:

1. *Heredity.*—Many instances of scoliosis have been observed in members of one family. This does not refer to cases which are rightly described as congenital, but to those which develop during childhood, and which are unassociated with malformation of the osseous spine. That scoliosis should occur in the consanguineous is only to be expected if the variation from the normal be due to an error in growth.

2. *Osseous Defects.*—An inevitable scoliosis results from certain malformations of the spine. The well-known deformity shown in Fig. 1 illustrates the typical wedge-shaped vertebra. Figs. 2, 3, 4 illustrate similar, and more complicated cases of the same type. This class may or may not be associated with cervical rib, fused ribs, elevated or diminutive scapula, spina bifida, etc. These cases approach more nearly to what might be termed a lateral curvature than do the acquired forms. These cases are somewhat rare, and do not account for the very common type of scoliosis. A congenital scoliosis indistinguishable from the prevalent type is occasionally met with. It is of course merely the result of the same cause operating at an earlier age than usual. Such irregularity in growth may similarly result in a congenital lordosis. These uncommon cases lend support to the view that the accidental circumstances of school life have little or nothing to do with the genesis of a scoliosis.

3. *Rickets.*—This city has a somewhat unenviable reputation for want of uniformity in the human frame, hence a bias in favour of rickets being implicated in scoliosis might be expected. However, in my experience rickets and scoliosis are not frequently associated, unless we include all bony

Fig. 1.

Fig. 2.

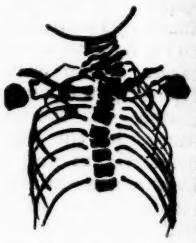

Fig. 3.

Fig. 1.—Tracing of congenital scoliosis, L. W., 3½ years old. First observed seven months previously. Incomplete duplication of first lumbar vertebra.

Fig. 2.—A. H., aged 6 years. Congenital scoliosis. Fourth, fifth, and sixth vertebrae fused and incomplete. Graft of fibula applied along convexity after division of ribs.

Fig. 3.—H. P., aged 4 years. Congenital scoliosis; malformation of upper dorsal vertebrae; elevated diminutive scapula; fusion of ribs, contraction on right side. Nine ribs on right side. Contraction of tissues on right side of neck; levator divided with part of sternoma told. On left side body of second dorsal vertebra scooped out with obliteration of the discs on each side. Fixation apparatus.

irregularities in growth as having such a source. Many of the deformities are considered to be due to the so-called late rickets. If, however, the disease be considered as due to late rickets it does not advance the problem very far, for this condition itself requires elucidation, and there is no consensus of opinion as to what really late rickets is. Ordinary rickets is a disease which affects the very young, while scoliosis develops in late childhood. Rickets does not show such a predilection for the female sex as does scoliosis. When rickets attacks the spine the curvature is usually posterior and is to a large extent reducible. When the spine becomes warped in this disease it is usually late in making its appearance and is often the result, apparently at least, of inequality in the length of the legs. This causes the pelvis to tilt, with a resulting compensatory scoliosis especially noticeable in the

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 4.—M. M., aged 8 years. Congenital scoliosis; spinous processes much deflected; curvature acute; situation unusual for ordinary type. Operation indicated.

Fig. 5.—R. S., aged 7 years, the subject of extensive infantile paralysis.

Fig. 6.—R S. Fully extended. Rotation of the lumbar vertebrae still persisting. Antero-posterior view.

lumbar region. At first in rickets the bones are soft, but in scoliosis they are not so.

4. *Tuberculosis.*—When the spine is affected it is seldom that a lateral curvature is produced, and it does not concern us at present.

5. *Fracture, tumours, and osteo-arthritis* may be merely mentioned as causative factors in scoliosis.

6. *Paralysis.*—Syringomyelia, Friedreich's ataxia, hemiplegia, and spastic paraplegia may be the cause of scoliosis, but are sufficiently rare to warrant their exclusion from further consideration.

Infantile paralysis is a fertile source of scoliosis and it furnishes many examples. It must therefore be admitted that a defect located in the muscular system may be the forerunner of a spinal curvature, but such cases differ materially from the ordinary type. The curvature develops late in the course of the paralysis and it remains for a long time more or less reducible by extension. (Figs. 5, 6, 7, 8.)

* A demonstration given at the Annual Meeting in Glasgow of the British Medical Association.

7. *Muscular weakness* is a fertile source of kyphosis, but it seldom is the cause of a scoliosis.

8. *Muscular spasm* used to be considered an important factor in the production of a scoliosis.

Guerin[1] introduced deep section of the prominent muscles and induced even the conservatives of this country to try the plan, but it did not find any lasting favour.

9. The scoliosis complicating a *wry-neck* not due to a congenital malformation is secondary and compensatory (Fig. 9).

FIG. 7.

FIG. 8.

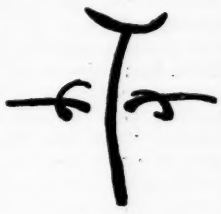

FIG. 9.

FIG. 7.—H. M., aged 6 years, suffering from extensive infantile paralysis.

FIG. 8.—Showing the amount of reduction produced by extension in paralytic case. Antero-posterior view.

FIG. 9.—M. K., aged 15. *X*-ray tracing illustrating amount of scoliosis present in torticollis.

The cure of the wry-neck causes the disappearance of the curvature of the spine.

10. *Postural.*—A less definite theory implicating the nervous system has been introduced by Bankart in a couple of articles entitled "Postural or so-called static deformities."[2] In the section relating to scoliosis it is stated that "postural scoliosis originates as a functional nervous disorder." I have yet to come across a case which could be described as postural.

11. *Empyema* occasionally is the beginning of a spinal deviation, but it is surprising how the spine even in a delicate fragile child withstands the collapse of one side of the thorax without manifest deflection. In empyema the deflection tends towards the sound side (Fig. 10).

12. Scoliosis results to a slight degree only because of *inequality in the length of the legs.* Where the inequality is due to rickets the spine may partake of the disease, in which case the scoliosis is caused by the rickets. Apart from this such curvature occurs late and advances only sufficiently to

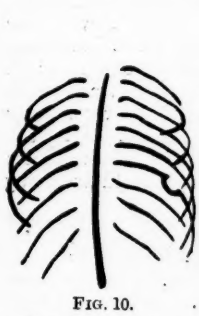

FIG. 10.

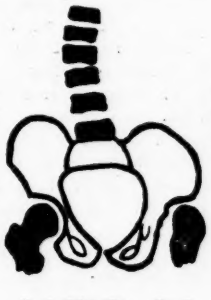

FIG. 11.

FIG. 12.

FIG. 10.—Slight scoliosis following empyema. Note regeneration of ninth rib where resected.

FIG. 11.—J. S., aged 5 years. Scoliosis, primary in dorsal region, and in direction contrary to that supposed to result from short leg (congenital dislocation).

FIG. 12.—McC., aged 5 years. Extreme possible lateral flexion in a normal spine.

be compensatory. I have recently come across a case of congenital dislocation of the hip associated with scoliosis. The short leg did not, however, prevent the curvature being as shown in the figure, opposite to what was to be expected (Fig. 11). If a short leg caused a scoliosis it should have a marked influence in correcting a scoliosis developing in the opposite direction.

13. *Gravity.*—No doubt scoliosis is at least partly due to the upright position of mankind—for example, the production of scoliosis in paralysis. Its influence is, however, corrected during the periods of repose in the recumbent position. On the other hand, the influence of gravity must exert stresses and strains which tend to make the spine absolutely straight In any case the effects of gravity apply to everyone, yet scoliosis is, after all, a comparatively rare lesion. Its more common effect is to produce kyphosis and it takes years to do it. The prolonged assumption of the horizontal position has not resulted in the cure of the deformity.

Notwithstanding the multiplicity of theories scoliosis still remains more or less of a mystery. That rickets may be a cause is undoubted, but this does not explain how rickets works in such a direction; indeed, rickets itself requires explanation. We trace the defect far enough back if we determine that the error is one of growth, and understand its exact mechanism. We may theorize about the effect on growth of the endocrine glands, the vasomotor system, etc., but to understand the mechanics of the trouble is sufficient at present.

The view I wish to bring before you is that practically all cases of scoliosis are due to inequality of growth between the posterior part of the spine and that part composed of the bodies. It consists in an error of balance between the posterior and the anterior columns, not one due to a lateral inequality of growth. This makes a very great difference in the pathology and treatment of the condition. If it is remembered that the essential element in scoliosis is a

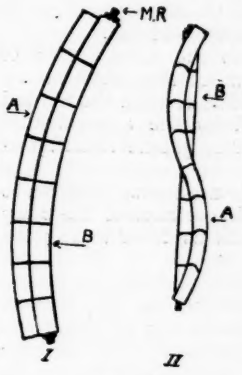

FIG. 13.

FIG. 14.

FIG. 15.

FIG. 13.—Diagram of model to show the production of a scoliosis. Two columns of corks, one having a metal rod (M.R.) threaded through column B. Both columns are encased in a thin rubber tube (not illustrated). If both columns are bent as in figure I, it is obvious that column A must be lengthened. If, however, the rod is made to resume the straight aspect, column A will assume the form shown in figure II. The elongated A can only retain relationship with B by convoluting.

FIG. 14.—Miss B., aged 28. Mid-dorsal scoliosis. Lateral view showing obliteration of normal dorsal kyphosis.

FIG. 15.—Miss B. Lumbar curvature increased; individual vertebrae elongated.

rotation of the vertebrae and not a curvature we may understand how great must be the dynamic force causing the deformity at its onset.

The spine is more or less a rigid structure; it is in no sense, even in delicate girls, what has been described as "willowy"—indeed, the more "willowy" the less likely is it that a scoliosis will develop (Fig. 12). A small amount of movement is allowed in various directions, but the range is strictly limited. In the dorsal region the range is more limited than any other part, yet it is just in this region that the deformity takes place. It must take place because any excess of growth in one section over another cannot here be accommodated, as it can be in the more mobile sections. If the spine were willowy, as in quadrupeds, a little irregularity in growth would not result in obvious deviation. As a support the spine may be divided into two parts, an anterior column composed of the vertebral bodies and discs, while the laminae and spinous processes together form a posterior column. If the anterior column does not keep pace with the posterior it becomes a mechanical necessity for curvature to result. Kyphosis results from inefficient anterior growth, while lordosis results from anterior overgrowth. A very considerable amplitude is allowed in the lumbar region and in the cervical, but little is possible in the dorsal. Such inequality in growth in this part of the spine must find another plan for taking up the inequality. In scoliosis the overgrowing anterior column does this piece of accommodation by assuming a wavy configuration; rotation of the individual vertebrae is an essential concomitant. Reference to Fig. 13 will better explain the mechanism.

1. This view explains how the curvature of the anterior column made by the bodies of the vertebrae takes place before any apparent curvature is noticeable when viewed from

the back, and that it is always greater than any such visible curvature. This, of course, implies a rotation of the bodies —an almost impossible contortion of the parts unless we regard it as of a gradual production by growth.

2. It explains the simultaneous production of the so-called secondary curvatures, which are not secondary at all. Such curvatures are usually double, may be treble, or even present as five undulations.

3. It explains the early flattening of the back or local lordosis accompanying the elongation of the anterior column. The obtrusive posterior curvature is more apparent than real; it is largely due to projection of the angles of the ribs. When such lordosis is marked the disproportion in length of the two columns is probably great; hence this feature is regarded as unfavourable. The normal posterior curvature is, of course, obliterated early in development of the malady. Fig. 14 illustrates this sign very well. Fig. 15, on the other hand, shows the excessive lumbar curve and the elongated bodies.

4. The difficulty of reduction by almost any means becomes more easily understood.

5. It gives an explanation of the slow development of scoliosis in the congenital wedge-shaped vertebra.

6. It also may be used to support the Abbott plan of correcting the curvature in flexion rather than extension.

7. It further renders comprehensible how, when the normal spine has been artificially deformed by the experimental application of the Abbott jacket, it straightens itself spontaneously if not interfered with.

The signs and symptoms of scoliosis are too well known to refer to, but I might accentuate the importance of the *x*-ray examination. The skiagram prevents us from taking too optimistic a view of our treatment.

The only anatomical alteration which might be referred to is the change in the shape of the bodies and the development of the wedge shape. This occurs late in the course of the disease. One need not look to the intervertebral discs for the key to the mystery of scoliosis, but to the epiphyses of the bodies. The discs are inert, passive indeed; they compress during the day to the extent of 1/2 to 3/4 in. Forming as they do one-fifth of the entire column, this means only a small condensation in each.

The treatment of the malady is the important and the most difficult section of the subject. Adams[3] sums up the matter in the following sentence: "All the resources of medical and mechanical science are required either to cure or arrest the progress of the affliction." I fear that this opinion of Adams is shared by many; it certainly has been mine, and it has induced me to persevere with the forcible methods of correction—the Abbott jacket and operation.

The operation which I have been practising for some years is done in selected cases. It is carried out as follows:

A 4-inch incision is made over the convexity of the curve. It is placed just external to the tips of the transverse processes. The dissection will vary according to the locality, but the muscles are split rather than cut. The posterior nerve branches are conserved as far as possible, as their division is liable to be followed by the development of a hyperaesthetic area just where subsequently sustained pressure is required to be made.

Two, or at most three, ribs are resected from their angles to their articulations with the vertebrae. The pleura is very liable to injury, and the wound retractors should be wrapped in gauze to minimize this risk. The tissues over the vertebral bodies are raised from the lateral fossa, avoiding injury to vessels or nerves. One or two sets of intercostal vessels may require ligature, but in most cases it is possible to avoid ligaturing any vessel. On account of the deflection of the vertebral bodies towards the convexity they are much more accessible than would be expected. The body of the vertebrae forming the centre of the curve is excavated and the same is done to the vertebra above and below though not to so complete an extent. The intervertebral substance is nibbled or cut away. With the finger in the cavity so made the spine is forcibly flexed towards the convexity in order to reduce the curve, to ascertain what amount of collapse, if any, takes place. Even when the cavity is large it is surprising how little the spine gives way. The wound is closed in layers without drainage.

A plaster-of-Paris jacket is applied with the spine flexed laterally as much as possible. The patient may get out of bed within the week, as it is desired to collapse the cavity in the bodies as soon as possible. With the gap in the anterior column it might be expected that a gibbus would form, but this has not been my experience. The posterior column, composed of the laminae, etc., is so strong that the spine does not collapse before the operative gap in the bodies fills up solidly.

The sutures are removed in three weeks if unabsorbable, and a new jacket applied again in extreme lateral flexion. From subsequent *x*-ray examination it has become plain that the curvature has not been immediately obliterated to the extent expected (for the reason given above), so that the operation resolved itself into an arthrodesis and obliteration of epiphyses. In the cases so operated upon I have been more than satisfied that the risk involved has been compensated for by the improvement. Having obliterated the growth of more than one vertebral epiphysis the distortion will tend to reduce as the posterior part of the spine increases in length. In one case it was not convenient to perform this operation, so a graft was applied to the lateral aspect of the spine with moderate success.

In the after-treatment I have found the felt padding employed in the Abbott treatment very irksome to the patient, besides being prone to displacement and in hospital patients to become the breeding ground for vermin. To obviate this I have inserted rubber bags in the two situations where padding will be required, and these may be inflated to the desired amount. The pressure so exercised has been much less objectionable to the patients.

As a routine I now treat all cases by the Abbott jacket, and in those which are advanced, or which show little tendency for the deformity to stabilize, I operate, but not after the age of 15, as little growth is to be expected subsequently. A jacket, either plaster-of-Paris, celluloid, or made by the instrument maker, should be worn for some years. The *x*-ray examination of the spine will provide data on which to proceed as regards further treatment. In some cases a jacket should be permanently applied. A slight reduction of the curvature, visible on the skiagram, means a great step towards cure; it implies a reversal of the forces which originally warped the spine.

I need hardly refer to the prognosis more than to say that the subjects of scoliosis who are neglected, or left uncured or not improved, do not live long. This also is my apology for applying a somewhat severe and risky operation to alleviate the condition.

REFERENCES.

[1] Guerin: Cit. from Adams's *Lectures on Curvature of the Spine*. Second edition, 1882. [2] Bankart: Postural or So-called Static Deformities, British Medical Journal, April 16th, 1921, p. 587. [3] Adams: Loc. cit.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

SPLENECTOMY, APPENDECTOMY, AND CAESAREAN SECTION IN THE SAME PATIENT.

In view of the large number of patients who resign themselves to a life of semi-invalidism after a single major abdominal operation, the following case may be of interest.

Mrs. R., married eight years, had the spleen, weighing 12 oz., removed at the age of 31, for acholuric jaundice; at 32 the appendix was removed for acute appendicitis; at 33 she was delivered at term of her first child, a female, weighing just over 6 lb., by Caesarean section for generally contracted pelvis, after twenty-four hours' labour. After the last operation there was some trouble with a stitch abscess or infected haematoma, but both mother and child are doing well, and leaving hospital in rude health.

Gerald Sichel, F.R.C.S.
Gordon Ward, M.D.

Sevenoaks and Holmesdale Hospital.

ADRENALINE: TOXIC DOSE.

A lady, who suffered from periodic attacks of asthma, was in the habit of administering hypodermically to herself two or three times a day, on the advice of some consultant, 10 minims of adrenaline solution during an attack.

An attack supervened as she was about to return home from the north of England, on a very troublesome journey. She administered 20 minims, and repeated it every two hours (with very little relief) for six doses. On her arrival home she had administered 120 minims of an undiluted solution of adrenaline (Parke, Davis, and Co.) in ten hours.

I was called to see her, and found her condition alarming. She was intensely pale, collapsed, pulse almost indistinguishable, and she had blurred vision, anuria, and intense thirst. Her condition improved quickly on the administration of amyl nitrite, and when later an administration of morphine and atropine was permissible to alleviate the asthma, after two doses at intervals of four hours she had regained the normal.

I am unable to find any evidence of so much adrenaline being taken in so short a time. I have very little doubt that another dose or two would have proved fatal.

Buxton. Frank R. Sawdon, M.B.

Reports of Societies.

FORTY-FIVE YEARS OF MEDICAL PROGRESS.

AT a meeting of the Medical Section of the Royal Society of Medicine on October 24th Dr. G. NEWTON PITT, the President, delivered his address from the chair.

Dr. Newton Pitt chose for his subject the advances in medicine since he became a medical student forty-five years ago. The increased knowledge of disease, with consequent improvement in treatment, had been due, in the first place, to bacteriology; secondly, to the revolution in surgery; thirdly, to the establishment of laboratories, with experts in microscopy and biochemistry; and fourthly, to much more minute attention to physical signs. The discovery of the organisms of enteric, tuberculosis, malaria, diphtheria, and syphilis had in each case been momentous; likewise the discovery of serums and vaccines. The use of diphtheritic antitoxin had reduced the mortality in the larger hospitals from 40 to 7 per cent. The revolution in surgery appeared a wonderful thing to those who remembered the conditions obtaining forty-five years ago, when only the pioneers were using the carbolic spray, and when operating coats were invariably dirty, and gloves, caps, and sterile overalls and dressings unknown. With the coming of aseptic surgery it was possible to deal with abdominal lesions which were not amenable to medical treatment, and at the present time the abdomen possibly was opened too frequently. The majority of cases of gastric and duodenal ulcer would heal under medical treatment, but in about one-third of the cases, owing to perforation, adhesions, fibrosis, or other mechanical conditions interfering with peristalsis, relief could be obtained only by surgical methods. With modern aids to diagnosis the existence of an ulcer could be detected much more easily and certainly than before, so that it might be expected that deaths due to ulceration would have diminished; but Guy's Hospital records showed the total mortality due to gastric and duodenal ulcers to be greater than it was forty years ago; the number of fatal cases of peritonitis also was on the increase. It was clear from a study of the figures that during the period under review there had been a steady increase in the number of cases in which there was some infective process in the alimentary canal. The incidence of appendicitis was very remarkable. The hospital records showed for some years before 1889 an average mortality of about three deaths in two years. For the last fifteen years the average had been twenty a year. Previous to 1889 fewer than twenty cases were admitted to the hospital in a year; by 1899 the number admitted had increased to 100 or more, and now the number was 400 or 500. The inflammation also was much less acute in the early days. In only one out of eleven cases in 1888 was the appendix removed, and yet there were no deaths. It would be almost out of the question to take a series of eleven cases at the present time and have them all recover, with the removal of the appendix in only one instance. Another notable advance was represented by the information now to be obtained from the chemical examination of secretions, excretions, and blood. The staining and counting of the blood cells was so familiar that people did not always remember that it did not come into general use until 1888, while the Wassermann reaction was first used only in 1906, and the estimation of urea and sugar in the blood was of still more recent date. Important help was now afforded through improved instruments for internal observation, especially *x*-ray apparatus. With the use of *x* rays and the bismuth meal the alimentary canal could be mapped out from end to end, and it seemed possible now, with the injection of gas, to outline radioscopically the solid viscera. But the introduction of very powerful *x*-ray apparatus would prove a serious danger to the habitual user unless more stringent precautions were enforced. In all these examinations team work should be encouraged, but it was important that the clinician should have the last word.

Dr. Newton Pitt went on to speak of the change of view which had taken place with regard to some familiar diseases. It was now well understood that tuberculous infection was very frequent among town populations, and that recovery was the rule and not the exception. Forty-five years ago the possibility of recovery from phthisis was hardly credited, and heredity was looked upon as the dominating factor. The most striking example of diminution of virulence in disease was afforded by scarlet fever, the mortality of which had greatly diminished, although the disease came in periodic waves, so that the incidence in 1921 was more than treble what it was in 1920. Formerly the mortality from scarlet fever was as high as 30 per cent.; by 1900 it had fallen to 5 per cent., and now it was less than 1 per cent. In Paris for many years this disease had been looked upon as a very trivial one, and it was tending to be so regarded in England. During the period between 1880 and 1920 the mortality from measles, whooping-cough, and phthisis was reduced by more than half. Improved methods of treatment had reduced to negligible proportions small-pox, anthrax, glanders, hydrophobia, and tetanus. Another very striking fall was the diminution in mortality from liver and gall-bladder disease, a diminution which must be attributed rather to surgery than to medicine. Influenza had been a perennial scourge of recent years, and with this was probably associated in some way the increase in appendicitis. Pneumonia, cancer, hemiplegia, heart disease, and digestive disorders showed no diminution in mortality and no material improvement.

In medical custom one great change to be noted was the reduction in the amount of stimulants used in hospitals. When he first joined the hospital the ordinary diet for the hospital patient included two or more pints of beer or stout, and in all serious illnesses spirits were prescribed. Alcohol was now given only in special cases, and with great moderation. One advantage which the medical man of to-day had over the man of a generation ago was the present largeness and accessibility of medical literature, particularly in the form of abstracts. In what direction was medicine likely to advance? There was no doubt that Sir James Mackenzie was right in insisting that the most urgent need was a fuller knowledge of the habits and slight deviations from health which led to disease later. The mortality from renal, vascular, and most of the nervous diseases, also from pneumonia and bronchitis, had not been appreciably diminished during the last fifty years. There was much to learn as to the infections which ultimately produced arteriosclerosis. Gout, rheumatoid arthritis, and other degenerative lesions might conceivably be prevented in the future; they could not be cured in the present.

Dr. HECTOR MACKENZIE, in proposing a vote of thanks, said that he himself was able to look back upon the same length of time as Dr. Newton Pitt. He could endorse what he had said about the incidence of appendicitis. Years ago at St. Thomas's this was regarded as an extremely rare condition, but after the operative era commenced they began to find how common a thing it was. Nevertheless, he was not so sure that actual perforation of the vermiform appendix had become much more common than it was before. With regard to tuberculosis, he thought that those went a little too far who assumed a universal infection of the race with tubercle. It might be true, but he did not think it had been absolutely proved.

Dr. BERNARD MYERS, in seconding, said that years ago he worked under the late John Duncan, the first to use spray for the disinfection of the air, and he had often heard him describe the conditions in those early days when the carbolic spray made everybody sneeze and feel unwell. The speaker went on to say that in one district where he had occasion to go to study the death returns for the year the thing that had struck him was the want of diagnosis. Such entries as "convulsions" and "heart disease" were useless from the point of view of statistics. It was possible that in many respects the clinician had become very much more accurate in diagnosis. He was able to confirm his diagnosis nowadays through the help rendered to him by the biochemist and others doing special work, though the final diagnosis must be made by the clinician himself. It was well to preserve a sense of balance with regard to methods of treatment. Many people, for instance, were advised, on account of some septic condition, to have all their teeth removed, and having submitted to this they became very much worse than they were before. With regard to tonsils, he still did not understand why it was that some surgeons were taking out practically all tonsils. There were cases where the tonsils must be removed, but there were also many in which this was not essential. It was necessary to observe carefully and come to a calm judgement on all these clinical matters.

The Eradication of Glanders and Anthrax.

Major-General Sir JOHN MOORE, F.R.C.V.S., read a paper on the eradication of glanders and anthrax in men and animals. In no instance, he said, could the progress of veterinary science be so clearly demonstrated as in the

eradication of glanders, thanks to the use of mallein as a diagnostic agent. Last year only three outbreaks of glanders were recorded, and this year only two, whereas in the years from 1900 to 1906 the outbreaks each year numbered more than 1,000. The extinction in human practice depended, of course, upon the extinction of the disease in animals. With regard to anthrax the position was much less satisfactory. Despite present knowledge and measures of control, anthrax continued to prevail, and the situation in respect to its eradication seemed wellnigh hopeless. He gave some interesting examples of how soil infection was the chief factor in the incidence in India, though this was not so prominent a factor at home. An analysis of cases of anthrax amongst animals in Great Britain showed that infection resulted mainly from imported foodstuffs. Here again a reduction of the incidence in human beings was dependent upon the completeness of the control of the disease in animals. He criticized the inadequacy of control in India, and the need for improvements in the civil veterinary department there.

ECONOMICS AND TUBERCULOSIS.

A meeting of the Section of Epidemiology and State Medicine of the Royal Society of Medicine was held on October 27th, the President, Colonel R. J. Reece, C.B., M.D., in the chair. Dr. R. J. Ewart read a paper on economics and tuberculosis. Dr. Ewart, having referred to the eugenic hypothesis that selection had been a principal factor in the decline of mortality from tuberculosis, suggested that a simpler explanation could be given. He displayed diagrams showing a close parallelism between the changes in real wages and the changes in the rate of mortality from phthisis. No similar correspondence with fluctuations of percentages employed was found, and he suggested that this was because the aid rendered by the Poor Law sufficed to maintain the state of public health during periods of economic depression without interfering with the economic life of the community. Dr. Ewart then remarked that it was common ground that the response of the somatic cell to infection by the tubercle bacillus depended upon the former's state of nutrition; he suggested that the response of the germinal cell needed consideration. He referred to the evidence published by various inquirers tending to show a higher male to female ratio at birth under unfavourable conditions. He thought that similar effects were operative when the offspring of early and late parturients were compared. Passing to the application of the hypothesis to the problem of tuberculosis, Dr. Ewart emphasized the fallacies inherent in the application of statistical methods to the scanty available data, but thought there was prima facie evidence that, due allowance being made for the age at death of the parent, children born in later life broke down earlier than those born to younger parents, and had a more variable mean age at breakdown. The inference was that bad conditions of prenatal environment led to the production of a unit of enhanced susceptibility and that the post-natal continuance of such unfavourable conditions led to destruction. He remarked that the fall in the birth rate was associated with a considerable change in the birth-age distribution and that, on that account, the mean susceptibility of the population was still decreasing. Dr. Ewart thought caution was needed in testing the theory on the basis of current rates of mortality. In his opinion a slight apparent increase of mortality from phthisis should be expected in the next two years, not because of the wave of unemployment but because the rate of the years following the war had been abnormally low, owing to the bad conditions of the war period having hastened the fatal issue in a proportion of cases. Any increase in 1922–24 was to be regarded as a return to the normal rate of decline. Dr. Ewart's general impression was optimistic; the somatic cell had responded to the improvement of food supply, the reproductive cell was beginning to respond, thus the level of immunity would be raised and a further decline of phthisis mortality produced.

In the discussion which followed, Dr. Major Greenwood said that Dr. Ewart's paper consisted of two parts—the first, which dealt with the general correlation between economic prosperity and the prevalence of fatal tuberculosis, displayed in an interesting fashion a relation which he (Dr. Greenwood) supposed everyone appreciated in a more or less vague way. But it certainly did not follow from Dr. Ewart's curves that antituberculosis measures other than improving national nutrition were unimportant. He also failed to follow Dr. Ewart's argument that the machinery of the Poor Law was so efficient that the standard of nutrition did not deteriorate when the percentage of unemployed persons increased. The second part of Dr. Ewart's paper propounded the interesting hypothesis that the powers of resistance to tuberculosis of children born to parents in the latter part of the fertile period were less than those of children born to young parents. Since the decline of fertility of the last generation affected fertility at later ages more than fertility at younger ages, Dr. Ewart's suggestion was, apparently, that we had here another factor likely to continue to diminish the death rate from tuberculosis. The suggestion was interesting, but a partial coefficient of correlation of 0.26 was a shaky foundation upon which to build, particularly when, for technical reasons, the probable error was difficult to interpret. From a statistical point of view, he did not feel able to draw any conclusions and could only regard Dr. Ewart's evidence as suggestive.

Dr. S. Vere Pearson thought that Dr. Ewart's paper reinforced the arguments used by Dr. Baskett in various communications to the British Medical Journal. Dr. Pearson was of opinion that the economic element in etiology was of great importance, and that in recent public health actions it had not always been given the weight it deserved.

Dr. A. K. Chalmers commented on the fact that in Scotland the death rate from tuberculosis began to fall about 1874, after the importation of foreign meat had begun to be considerable, and the decline was associated with increasing use of meat. He thought that it might be more than a coincidence that the great decline in child mortality began in or about 1900, when the first generation to feel the effects of an improving food supply were becoming of reproductive age.

Dr. Coutts said that no one would doubt the immense importance of the nutritional factor in the etiology of tuberculosis, dramatic examples of which were afforded by the war-time experience of Poland and Austria. He shared Dr. Greenwood's scepticism as to the interpretation of the curve of unemployment and as to the sufficiency of the Poor Law to account for the lack of apparent correlation. The complete statistics of 1922 were not available, but the first quarter of that year showed an increase in mortality from tuberculosis over the first quarter of 1921. All would agree with Dr. Pearson's contention that if taxation for public health measures lowered real wages it was bad for the public health, but it was not clear that this had happened. Again, it was not the policy of the central authority that tuberculosis officers should devote the major part of their time to treatment; it was intended that they should regard preventive work as their chief aim. He thought interlocal statistical comparisons more likely to be of value in the measurement of the effect of various measures than massed data, and deprecated the attribution of the total national effect to any one factor.

Dr. Hamer said that two of the speakers had warned members not to speak disrespectfully of the tubercle bacillus; for his part he regarded the bacillus with deep respect, but must call attention to the fact that Dr. Bulstrode had been a true prophet in his forecast of what would happen to the rate of decline of tuberculosis.

Dr. Williamson said it was becoming fashionable to attribute the decline of tuberculosis to everything but antituberculosis measures, but active workers were still convinced that infection played a predominant part. In war time imported labour corps suffered severely, although their economic condition had been improved; in Sweden, although the economic position had presumably improved, the death rate from tuberculosis had not declined.

Dr. J. C. McVail could not suppress a doubt whether the money saved by cutting down health services would really be spent upon food. There were such things as cinemas and football matches. On a certain occasion it was suggested that a supply of spikenard might have been sold for a great sum and the money given to the poor, but still the doubt crept in whether it would have been given to the poor. He thought there must be a certain proportion of waste in every kind of expenditure, and that the educative value of public health efforts in respect of housing, feeding, and general sanitation were in themselves enough justification for what had been done. The greatest sanitarian of Scotland, the late Dr. J. B. Russell, had been a great educator.

Dr. R. J. Ewart, in replying, said that Dr. Baskett had done pioneer work on the relation between economics and disease, and that he himself had followed a similar line, but with rather different data. He agreed that the evidence on

the influence of parental age was no more than suggestive. The sample (200 observations) was small; it was not a random sample of the general population, and the regression was not linear.

THE NOTIFICATION OF INFECTIOUS DISEASES.

At a meeting of the Harveian Society on October 26th, held at Paddington Town Hall, a discussion took place on the notification of infectious diseases. Sir William Willcox, President of the Society, was in the chair.

Dr. Reginald Dudfield (Medical Officer of Health for Paddington) introduced the subject with a short history of notification. It was in response to the urgent demands of medical officers of health that notification of infectious diseases was introduced. The appointment of such officers was a consequence of the report of the Royal Commission on the health of towns (1845), and the first officer was appointed in 1847 by the city of Liverpool. In London the placing of medical officers in charge of various parishes and districts led to the formation of what was now known as the Society of Medical Officers of Health—an organization which played no small part in bringing about notification. The efforts of the British Medical Association in the same direction should also be noted. The most important function of a medical officer of health was the prevention of disease, but the discharge of such a function presupposed a knowledge of the presence of disease in a community. In London it became at once the practice for the Registrar-General to forward every week to the medical officers of health copies of the entries in the registers of deaths made by the district registrars. The analysis of the returns was carried out in different ways. In 1855 Sir Benjamin Ward Richardson began the tabulations which he published in the *Journal of Public Health*, and in 1855 the British Medical Association began the collection and publication of statistics of sickness and mortality. The various attempts to collect and analyse the returns, however, were generally a failure, owing in most cases to loss of interest on the part of the persons charged with supplying the basic facts. Appeals were made to the Government to set up a national system for the registration of disease. It was uncertain at what period the demand for registration of disease was replaced by a demand for the notification of infectious disease, but the latter demand was resisted by the Government until the utility of notification had been demonstrated by local experiment. Such notification was first brought into operation at Huddersfield in 1876, and at Bolton in the following year. At the end of 1881 more than a score of cities and towns, all of them except one (Reading) in the north of England, had introduced notification in their areas, in each instance by a private Act of Parliament. Then came the well-known Notification Act of 1889, whose provisions were at once adopted by nearly a thousand sanitary authorities. In London the earliest proposal to extend notification appeared to be in a circular letter from the Local Government Board in 1894, following cholera outbreaks of the two previous years.

Dr. Dudfield then submitted a list of diseases to be notified in the county of London:

Anthrax	Erysipelas	Polio-encephalitis (acute)
Cerebro-spinal fever	Glanders	Poliomyelitis (acute)
Cholera	Hydrophobia	Relapsing fever
Continued fever	Malaria	Scarlet fever
Diphtheria	Membranous croup	Small-pox
Dysentery	Ophthalmia neonatorum	Trench fever
Encephalitis lethargica	Plague	Tuberculosis (all forms)
Enteric (typhoid)	Pneumonia	Typhus fever
	Puerperal fever	

Measles, first cases only, had to be notified in seven boroughs, and all cases in two; German measles, first cases in four boroughs, and all cases in one (Paddington); whooping-cough, first cases in one borough (Battersea), and all cases in three boroughs; and diarrhoea, zymotic enteritis, in three boroughs among young children only, in two boroughs during the summer months, but with no age limit, and in one borough (Woolwich) all cases throughout the year. In Greater London, including the counties of Essex, Hertfordshire, Kent, Middlesex, and Surrey, the list just given held good, except that anthrax, glanders, and hydrophobia were only notifiable in certain areas, chicken-pox was notifiable in ten areas, measles and whooping-cough (generally first cases only) in a few areas, and epidemic diarrhoea in Beckenham during the summer months.

Speaking from his own practical experience, which covered the period since the Act of 1889, Dr. Dudfield said that he found notification of the diseases laid down originally in that Act to be very complete, with the exception of puerperal fever. Once or twice a year deaths from that disease came to his knowledge without previous notification. All cases of sepsis ought to be notified whether after delivery at term or after miscarriage or abortion. With regard to pneumonias, approximately one-sixth of the deaths in 1921 due to primary lobar pneumonia represented cases which had not been notified. The notification of diseases not in the original Act was improving every year, except in the case of tuberculosis. Compulsory notification of tuberculosis was preceded by voluntary notification in a number of sanitary areas. In 1911 voluntary notification was in use in the areas of 321 authorities, in one of which (Carlisle) it covered all forms of the disease, and not the pulmonary alone, as in the other areas. In many areas it did not prove successful, and compulsory notification was introduced, the first area to adopt it being Sheffield in 1903. The notification of tuberculosis left much to be desired. From 1914 to 1918, 20·5 per cent. of the deaths due to pulmonary tuberculosis were in cases which had not been notified, and of the deaths due to other forms of tuberculosis 51 per cent. had not been notified. That this was not due to war conditions was shown by the figures for a later period, 1919–21, when the percentage of non-notified cases among the deaths was 24.1 and 56.2 in the two categories respectively. The notification of pulmonary tuberculosis was not popular with the public, nor with some members of the medical profession. He was inclined to think it would be advantageous to notify tuberculosis as suspect only in the first instance, with a view to admission to a hospital for observation. The doubt in the public mind with regard to a possible error in labelling would thus be removed.

A Demand for Revision of the List of Notifiable Diseases.

Dr. Charles Buttar said that Dr. Dudfield had treated the subject so seriously that he was nervous about reading the ribald remarks he had prepared. His contention was, however, that notification was a nuisance to doctors and an expense to ratepayers. Notifiable diseases were piled up without any clear consideration of the reasons for making them notifiable; diseases no longer or never worth notifying were kept on the list, and complications were introduced by allowing various bodies to make orders for notification and withdraw and reintroduce them. Originally there were eleven diseases notifiable in the county of London; now there were about thirty. It would be interesting to know how many medical officers could recite the thirty and give the reasons why each was notifiable. Some of them were notifiable in one area and not in another, or at one time and not at another. It was an annoyance to be called upon to notify rubella in Paddington and not in Kensington, whooping-cough in Willesden and not in Paddington, while the in-and-out antics of chicken-pox were exasperating. Nothing but real tangible benefit could justify such anomalies, and the annoyance was not soothed by payment of a fee, whether half a crown a case for whooping-cough, or a shilling a dozen or a gross for measles, as with families and institutions during the war. The original object of the Acts, which was to control the disease with a view to its extirpation, had been modified by subsidiary propositions, such as the benefit of the individual sufferer and the advancement of knowledge. He urged that the utmost care should be exercised in the selection of notifiable diseases; the object of notification in each case should be definable and reasonably attainable, and the decision as to the suitability for notification would be best arrived at after preliminary discussion between health officers and medical practitioners.

Dr. Buttar went on to challenge certain inclusions in Dr. Dudfield's list. Two items in that list—continued fever and membranous croup—he regarded as non-existent as notifiable diseases. The only condition in which he could imagine the existence of membranous croup was in a scalded throat, and if this was so he doubted its infectivity. Erysipelas and relapsing fever, he thought, had ceased to be worth notifying. Was it really necessary to fill in a certificate and for the public to pay half a crown because some old lady had scratched a streptococcus into her skin? As for relapsing fever, it would be interesting to know when and where this was last notified. Puerperal fever was insufficiently defined, and therefore unsatisfactory for notification. Medical officers ought to know exactly what they meant by the term and produce definite evidence that their efforts had led to diminution or control.

He could not imagine any real usefulness in the notification of puerperal fever except in the case of septicaemia. In diphtheria and scarlet fever the possibility of control was somewhat doubtful; at all events, the results of notification had not been startling. He was inclined to the view that nowadays the notification of scarlet fever was of little practical use. Diseases which did seem to be controllable were small-pox, cholera, typhus, and typhoid, and he submitted that the eleven diseases originally notifiable should be cut down to these four, together with diphtheria. With regard to additional diseases, anthrax, glanders, and hydrophobia, at present only notifiable under local orders in a number of districts, might be made permanently notifiable throughout the country as in the case of plague. It was conceivable that a good case might be made out for adding malaria to the list of diseases in which there was reasonable certainty of obtaining control; and encephalitis lethargica and cerebro-spinal fever might be retained, not because health officers were likely to be of the slightest use in controlling them, but because the conditions were comparatively new: they were dangerous, and something would be gained scientifically by submitting them to the opinion of experts. Whooping-cough, measles, and German measles should be removed from the list at once. If the gain to the community was worth the trouble and expense involved in notification, then notification should be extended to the whole country, and not appertain to here one area and there another. Diseases in which notification was not worth while were trench fever, dysentery, and acute primary and acute influenzal pneumonia. There was no reasonable hope of extirpating the pneumonias, however much they were notified. In tuberculosis notification had proved more useless than in other diseases. In the notification of tuberculosis there were many fallacies which reduced its value from the scientific point of view. Notification assisted very little in early diagnosis, and its objects could be met equally well by trusting the doctors. In conclusion, he urged that the Ministry of Health might wisely consult on this matter with the Royal Colleges and the British Medical Association, and the local medical officer of health might usefully seek the opinions of the practitioners in his area.

Dr. W. H. HAMER (Medical Officer of Health, London County Council) agreed with Dr. Buttar as to the lack of any particular value in the notification of measles, German measles, and whooping-cough. But in the case of some other diseases in the list he could not go as far. He would be very reluctant to see the notification of scarlet fever, puerperal fever, and ophthalmia neonatorum disappear. A great deal of value attached to the notification of the latter two, and with regard to scarlet fever he thought that hospital isolation was very useful indeed. When the mortality of scarlet fever to-day was compared with what it was in his own young days an enormous improvement was self-evident. A hundred years ago scarlet fever was a more terrible plague than it was in his own youth. He believed that the isolation of scarlet-fever cases in hospitals had a great deal to do with its present mildness. He would be sorry also to see relapsing fever disappear from the list. It was apt to prevail in association with typhus, and the amount of relapsing fever and typhus which had been in Europe since the war was not realized in this country. A case could be made out also for keeping plague and anthrax in the list of notifiable diseases, and he confessed that he had "a sneaking sort of regard for erysipelas." At the same time there was too much tendency to regard notification as good in itself, whereas it was only of benefit if it led to some practical issue. As to statistical value, the statistics furnished by notification were apt to be misleading. The Metropolitan Asylums Board in its annual report stated that in recent years the margin of error in the notification of typhoid fever had been something like 40 per cent. Notification might under-represent or over-represent the true incidence. In a case of doubt, for example, he was inclined to think that the proper course was to notify. From the statistical point of view, however, notification had the advantage that it enabled a tabulation of the case mortality to be made. It enabled one to test any supposed variation of disease in type, and he reminded the meeting of the remark of Murchison that when people talked about change of type in disease, what they were dealing with was not change of type, but mental revolutions in the minds of practitioners. On the whole he thought that notification ought to be treated with a good deal of respect, though it was not by any means the last word to be said about the diagnosis of disease.

Dr. T. CARNWATH (Ministry of Health) said that his chief interest in notification was from the point of view of public health administration, though the statistical aspect was also important. The diseases notifiable in London could be grouped under two main headings: those notifiable under Section 55 of the Public Health (London) Act, and those notifiable under order of the Local Government Board or the Ministry of Health. The list given in Section 55 could be extended, and was in fact extended, to measles, whooping-cough, and other diseases in certain boroughs, but that was a local matter over which the Ministry had very little control. Certain pains and penalties attached to the persons notified under this section, and therefore it was found desirable later, instead of using the section, to make the diseases notifiable by order because then the exact measures to be taken could be prescribed. If tuberculosis had been made notifiable under Section 55 all sorts of pains and penalties would attach to the notified person which might make it impossible for him to follow his profession. When the notification of disease was first introduced it was looked upon as an essential measure in the control of disease. The activities of public health officers resulted in the elimination of such diseases as typhoid and typhus, in which the environmental factor was principally concerned, but in the case of diseases in which the personal factor was concerned less had been done to affect incidence, though in the case of one disease in this group—small-pox—the state of affairs had been altered, chiefly by vaccination. Dr. Hamer appeared to think that measures of notification and hospital isolation had affected the mortality from scarlet fever. That was open to question, however, because from the statistics of some foreign countries where isolation and other customary measures were not adopted to the same extent the same decline in mortality from the disease was noticeable. When the local authority was notified of a case of scarlet fever it was mainly for the purpose of treatment, and once that conception was adopted one got local authorities, as at Willesden, asking whether there were not other diseases which could be treated to better purpose with the accommodation available than scarlet fever, at least in the mild form. One of the main purposes of the statistical department should be to study the trend of disease and the factors which influenced it, and to discover which of these factors was amenable to control. Personally he would like to see not only infectious diseases notified, but occasionally, and for other purposes, other diseases such as chlorosis. It had been hoped that the record cards of insurance practitioners would furnish particulars, but the suggestion had not been received with favour. It was natural on the part of a Government paying hundreds of thousands of pounds on the treatment of disease to inquire what diseases were most responsible for the mass of invalidity. From a cursory inquiry it seemed that about one-seventh of the money was paid out in respect of rheumatism, and the Ministry had started a special inquiry to find out what rheumatism connoted. Until it was known what diseases were chiefly responsible the Ministry would be undecided as to where to step in to help practitioners.

Dr. C. SANDERS (Medical Officer of Health, West Ham) said that he had some sympathy with the views put forward by Dr. Buttar. Notification, however, was introduced not for the purpose of keeping a check upon such physicians as Dr. Buttar, but to assist practitioners working among great industrial populations, where there was frequently poverty and carelessness or ignorance of hygiene. In his own district the notification of scarlet fever served a very useful purpose, because from the moment of notification certain administrative measures went forward automatically, and these were of the greatest value in stopping the spread in schools. The gravamen of the charge brought by Dr. Buttar arose out of the difficulties which practitioners encountered when the disease was notifiable on one side of the street and not on the other (the two sides being in different boroughs). Arrangements ought to be made for notification to be universal throughout the country. He could not conceive that the local affairs in one district could be so different from those in a contiguous district as to make notification necessary in the one and not in the other. He would welcome more notification rather than less.

Dr. HUBERT C. PHILLIPS said that when notification was compulsory in one borough and not in another the public was very quick to seize upon the anomaly. He advocated an order from the Ministry which would be irrespective of local option.

Sir WILLIAM WILLCOX, in closing the discussion, confessed that he would have been "ploughed" had he been required

to name all the diseases notifiable in London according to the list which Dr. Dudfield had brought forward. He did not agree with Dr. Dudfield in pressing for the notification of all suspected cases of tuberculosis. He had seen so many people put down as suffering from tuberculosis when they were not so at all that he felt that the notification of suspected cases would have a detrimental effect psychologically upon many people who would be proved afterwards not to have the disease. He would be rigid in the diagnosis of tuberculosis before notification. Not many months ago he saw a man of strong build and appearance, with no clinical signs of tuberculosis whatever, who had been sent to a sanatorium on the strength of an *x*-ray picture of his chest, and even the radiological finding was not confirmed by a second observer. A great deal of harm could be done by reckless notification of tuberculosis. The War Office had a rule that no case should be notified as tuberculous unless tubercle bacilli were found. Dr. Buttar's trenchant contribution had been most welcome and illuminating, though he could not agree with all his criticisms. He believed that relapsing fever should be retained on the list. In the war he saw a large number of cases of typhus and relapsing fever in Mesopotamia and Egypt; the two diseases always came in association, one after the other. It was true that many medical men had never seen relapsing fever in this country, but it was well known to their predecessors at the London fever hospitals, and they were aware of its differentiation from typhus and the association of the two diseases. He thought that scarlet fever also should be retained on the list. He had an opportunity of seeing cases of scarlet fever at the fever hospital, and he was impressed by the number of cases which came in from a case which had been missed. Dr. Carnwath had referred to the desirability of notification of some other diseases. Chlorosis, which he had mentioned, was almost unknown in the out-patient departments of London hospitals, and another disease almost unknown there was typical gout. There was no doubt that rheumatism—to use a loose term—was very much on the increase; probably it was the commonest disease at the present time. There was no doubt that complaints which he looked upon as streptococcal toxaemias occurred in people who were incapable of resistance owing to bad home conditions. It was noteworthy that both a medical officer of health (Dr. Sanders) and a general practitioner (Dr. Phillips) had said that they would welcome universal notification. It seemed absurd that diseases should be notifiable on one side of the street and not on the other, and he imagined that if it came to a legal issue it would be almost out of the question to secure a conviction against a practitioner for failing to notify, because the practitioner could hardly be expected to say to which of two contiguous areas the patient belonged.

Dr. Dudfield, in a brief reply, said that with regard to tuberculosis his suggestion was only that all cases of tuberculosis should be notified in the first instance as suspect, and the final notification should only be made after the patient had been under hospital observation. Time was an essential factor in the treatment of tuberculosis, and the provision of observation beds was being widely extended. As for Dr. Buttar, it had to be remembered that Dr. Buttar was an exceptional man: notification was not introduced for the purpose of controlling or assisting such as Dr. Buttar. The class of people with whom the speaker had to deal as notified persons was very different from the class of people among whom Dr. Buttar practised.

ROYAL MEDICO-CHIRURGICAL SOCIETY OF GLASGOW.

The second meeting of the session of the Royal Medico-Chirurgical Society of Glasgow was held on October 20th, when a number of interesting papers were read and cases illustrating them were demonstrated.

Early Opacities in the Senile Lens.

Mr. Inglis Pollock read a paper on the treatment of early opacities in the senile lens, and demonstrated six cases. He referred to a long list of many surgeons who had attempted at different times, and in different countries, to carry this out with the aid of potassium iodide and other alkaline salts.

Nearly all ophthalmic surgeons had seen at times traumatic cataract absorbed in part; and a certain number of cases of the spontaneous absorption of senile cataract were on record, so that it was undoubtedly possible for opacities to disappear in the human lens in comparatively rare cases, but the numerous cases which had been reported, especially during the last twenty years, showed that the alkaline treatment of senile cataract had been used successfully, and that the results were not due to spontaneous absorption nor to clearing of the vitreous or fundus opacities. He further considered that as early treatment was now recommended in general medicine as the proper treatment for every type of disease, therefore the early medical treatment of cataract should be tried in all cases, and if possible the patient should not be told of the existence of the cataract, so as to prevent worry becoming an element in the case.

Asymmetry of the Upper Limbs.

Dr. Matthew White made a short communication on a case of asymmetry of the upper limbs, and showed the patient. On examination after an injury to the right shoulder asymmetry of the arms was noted, the left apparently being the normal one and corresponding to the general development of the body. At the first examination the rest of the body appeared to be symmetrical, but ten months later there was scoliosis with tilting of the head, asymmetry of the face, and on several occasions inequality of the pupils. Sensation appeared to be normal in the affected arm; no difference in power as shown by dynamometric measurements was noticed, although the right hand tired more quickly than the left. The skin of the forearm and hand, as compared with the left side, was coarse and thickened. Cuts and abrasions on the right arm healed slowly and became purulent. The blood pressure and temperature were identical on both sides. Skiagrams of the bones of the hands and arms showed greater density and thickening on the right side. There was nothing of note in the region of the sella turcica.

Treatment of Rectal Prolapse in Children.

Dr. Leonard Findlay and Dr. J. D. Galbraith made a short communication on the treatment of rectal prolapse in children. The method referred to, that of Professor D'Espine of Geneva, consists in the introduction of a small amount of absolute alcohol into the loose areolar tissue surrounding the rectum. The operation is simple in technique, efficient in results, and apparently devoid of all danger. The speakers reported the results in 41 children. In 7 cases prolapse had been in existence for less than one month; in 10 cases it had been present for more than a year. In two cases the operation had to be repeated once, and in one case twice, but in all the other examples only one treatment was necessary to obtain a cure. Cure was obtained in 90 per cent. of cases.

Polydactylism of the Foot.

Mr. G. H. Edington and Dr. W. B. Primrose made a communication on a rare case of polydactylism of the foot. The subject of this communication was a male infant aged 4 months. The abnormality consisted of three supernumerary toes occupying the cleft between the hallux and the normal second toe of the left foot. The supernumerary digits were not at all in the same plane, one being dorsal and two displaced towards the plantar surface of the foot. These last were webbed in half their length and capable of active movements. The dorsal digit was not actually mobile. A skiagram showed three supernumerary metatarsal bones, two of which belonged to the plantar toes, and the third, which was imperfect, to the dorsal toe. A wedge of tissue, including the abnormal structures, was removed from the dorsum and the result showed little difference between the two feet.

Dr. W. B. Primrose said that the wedge of tissue removed by Mr. Edington showed upon dissection that the dorsal rudimentary toe had only two phalanges and a very imperfect metatarsal bone which had no tarsal articulation. It was bound to the lateral side of the adjacent toe in a loose manner by fibrous tissue instead of by ligament. The other toes were much better developed. Their metatarsals had tarsal articulations, but they possessed deformed cartilaginous phalanges. These two toes showed the normal arrangement of flexor and extensor tendons, while the dorsal rudimentary toe only possessed an extensor tendon. There were, in addition, two dorsal interosseous muscles, but one of them had the appearance of being formed by the fusion of two adjacent interosseous muscles. The greater part of the blood supply of these toes was apparently derived from the first dorsal metatarsal artery by two arcuate vessels which cross the two medial metatarsal bones dorsally. This suggested a relationship of all these toes with the hallux, which was of teratological significance. The digital cutaneous nerves were relatively normal.

BRITISH ORTHOPAEDIC ASSOCIATION.

THE annual meeting of the British Orthopaedic Association was held in London on October 20th and 21st, under the presidency of Sir ROBERT JONES. About seventy members and visitors attended the meeting.

On the morning of October 20th, at the Royal Society of Medicine, papers were read on: "Tumours of tendons and tendon sheaths," by Mr. ST. J. D. BUXTON; "Results of tendon transplantation for intrinsic hand paralysis (Ney operation)," by Mr. J. G. JOHNSTONE; "Kohler's disease of the tarsal scaphoid," by Mr. E. S. BRENTNALL; "Infantile paralysis," by Dr. LEVICK; "Some complications of supracondylar fractures," by Mr. W. R. BRISTOW; "Two cases illustrating the longitudinal growth of scar tissue, and a case illustrating the reaction of bone to pressure," by Mr. D. MCCRAE AITKEN; "Types of tubercle bacilli in surgical tuberculosis," by Dr. G. R. GIRDLESTONE; "Coxa plana," by Professor MURK JANSEN; "An operation for the relief of flexion contractures in the forearm," by Mr. C. MAX PAGE. In the afternoon the Association met at the Royal National Orthopaedic Hospital. Demonstrations were given by Mr. JACKSON CLARKE, illustrating the use of spinal supports; Mr. LAMING EVANS, the results of Whitman's operation for talipes calcaneocavus; Mr. R. C. ELMSLIE, fixation of the tendo Achillis for talipes calcaneus; Mr. BANKART, congenital talipes equinovarus treated by silk fixation after correction of the deformity; Mr. TRETHOWAN, bone grafting for malunited Pott's fracture, bone grafting for non-union of radius and clavicle, bone grafting to reconstruct acetabulum in congenital dislocation of the hip, arthroplasty of hips and knee, tendon transplantation for calcaneus, tendon transplantation (various), flat-feet, congenital club-foot, osteotomy for genu recurvatum, bilateral pes cavus; Mr. ROCYN JONES, the results of an operation for hallux valgus and rigidus, and some tendon transplants. Each of the surgeons afterwards performed an operation of the class which was illustrated by the cases he had previously shown.

On October 21st the Association met at the Royal College of Surgeons, where Sir ARTHUR KEITH gave a short demonstration, including a discussion of the osteology of a eunuch. Mr. LAWFORD KNAGGS showed specimens and discussed the pathology of serous periosteitis, osteitis fibrosa, osteomalacia, and leontiasis ossea. Dr. THURSFIELD and Mr. FAIRBANK briefly discussed conditions of generalized bone deformities in children. The specimens illustrating these several conditions were demonstrated in the Museum.

The dinner of the Association, held on Friday, October 20th, was attended by seventy-two members and guests.

WEST KENT MEDICO-CHIRURGICAL SOCIETY.

The first meeting of the session of the West Kent Medico-Chirurgical Society was held on October 13th at the Miller Hospital, Greenwich, when Dr. E. W. FARMER occupied the chair, and the annual reports were read and approved and officers for the ensuing session were elected. Dr. W. H. PAYNE was elected president and took the chair, and a number of clinical cases were then shown.

Mr. C. A. JOLL showed a patient, a young woman whom he had operated on for a myeloma which had destroyed the head of the humerus. A free-bone graft taken from the upper two-thirds of the fibula was inserted, which persisted and functioned, as was shown by the *x*-ray plate. He also showed the case of a boy with enlarged glands of the neck, which were tuberculous with a septic element. Dr. H. PRITCHARD showed a young woman with ascites suffering from mitral disease, which developed eighteen years ago after acute rheumatism. She had been tapped twenty-four times in twenty-one months, the quantity of fluid varying from 14½ to 20 pints. Dr. A. S. WOODWARK showed a case of ascites in a man who had been tapped seventeen times since November 15th, 1921. He had albuminuria, aortic regurgitation, and hypertrophy of the heart; 18½ pints was the average quantity of fluid removed. He also showed a boy suffering from Graves's disease, with tachycardia; he had been treated by *x* rays, bromides, and a fat-free diet, along with an ounce of cod-liver oil daily. An *x* ray plate of a gastric ulcer taken by Dr. BUCHAN was shown. Dr. H. CORSI showed, on behalf of Mr. H. DAVIES, a case of pseudo-elephantiasis, which did not extend below the ankle; a wedge-shaped mass of tissue had been excised.

Rebiews.

SMELL AND TASTE.

PROFESSOR G. H. PARKER of Harvard University has contributed a valuable monograph on *Smell, Taste, and Allied Senses in the Vertebrates* to a series of monographs upon experimental biology.[1] As the editors point out, the rapid increase of specialization and the adoption in biology of the methods of the exact sciences have rendered it impracticable for one author to cover satisfactorily the whole field; these monographs, of which seven have now appeared, stand as an indication of the great advance which the sciences of experimental biology and general physiology have made in recent years.

Hitherto the sense organs concerned with smell and taste have on the whole received less attention than the others, and yet biologically they are of very great importance. As Professor Parker, whose researches on these subjects are well known, deals with smell and taste, and certain other associated though less familiar senses, from the standpoint of their functional interrelation and genetic connexion, this monograph will prove of interest and value to a very wide circle of readers.

Each chapter is prefaced by a table of its contents, and at the end of each is a very complete bibliography. Another good feature of the book is that Professor Parker has provided a critical review of the evolution of knowledge of various aspects of the subject and a clear statement of the present position, together with suggestions as to the lines upon which future research may most profitably be conducted.

A lucid account is given of what has been ascertained with regard to the common chemical factor in substances which arouse the same taste, but, as the author states, although it seems beyond reasonable doubt that the sour taste is in some way dependent upon hydrogen ions, the problem of how these ions become effective has still to be solved. The peculiar chemical feature whereby the other tastes excite their effect is more illusive and less understood, but an excellent summary of the present position is placed before the reader. The author forcibly expresses the opinion that in gustation three and probably four well-defined senses may be distinguished, since their functional difference is beyond doubt, although structurally they have not yet been separated. To the reviewer structural distinction at the periphery does not appear to be a necessity; further knowledge of the representation of the gustatory sense in the central nervous system is of much more urgent and vital importance.

The consideration of the work which has been undertaken with regard to the physiology of olfaction is extremely thorough and complete, and, as an authoritative opinion is expressed on the value of all the more important investigations, this section must prove most helpful to everyone interested in this special sense. The work of Zwaardemaker with his olfactometer, by which he was able to measure olfactory stimuli, together with the modification of van Dam, and the more recent odiometer of Allison and Klatz are discussed. A full statement of the attempts to classify odours is presented and the difficulties which have been experienced in correlating the chemical formulae of substances which give the same smell are explained. The author admits that recent attempts to connect odour and chemical constitution are fragmentary, yet he inclines to the belief that this line of research promises to provide a solution of the problems as yet unsettled. In the light of this prophecy it is of interest to mention an effort by Heynix to put the olfactory sense on a physical basis; his researches, however, have been published since the completion of the monograph under review. Heynix has made use of Castelli's theory of resonance in vision, and demonstrates a correspondence between the size of the pigment granules in the olfactory mucous membrane and the wave-length which odorous substances emit. Professor Parker's masterly treatment of the subject is likely to attract more workers to this fascinating yet difficult problem. The concluding chapter on the interrelation of the chemical senses may be read with much enjoyment; it is full of information and suggestion, and must provide a stimulus to all readers of this most attractive monograph.

[1] *Smell, Taste, and Allied Senses in the Vertebrates.* By G. H. Parker, Sc.D. Monographs on Experimental Biology. Philadelphia and London: J. B. Lippincott Co. 1922. (Post 8vo, pp. 192; 37 figures. 10s. 6d. net.)

ENDOCRINOLOGY AND METABOLISM.

The five large volumes entitled *Endocrinology and Metabolism*[2] edited by Dr. Lewellys F. Barker, with Professor R. G. Hoskins and Dr. Herman O. Mosenthal as associate editors in endocrinology and metabolism respectively, contain in their 4,770 pages a series of monographs; the fifth and least bulky of the volumes is entirely devoted to the bibliography and general index of the first four volumes, the first two of which deal with endocrinology and the other two with metabolism. The ninety-eight contributors, with the exception of Professor Swale Vincent, who recently returned to this country, all hail from the United States and Canada, and are fairly equally divided between the two subjects; they include the well-known authorities G. N. Stewart, W. B. Cannon, A. S. Warthin, W. Timme, O. Klotz, D. Marine, F. M. Pottenger, and C. E. de M. Sajous on the ductless glands, and Graham Lusk, D. van Slyke, C. Voegtlin, P. B. Hawk, J. C. Aub, E. Du Bois, A. I. Kendall, E. C. McCollum, G. R. Minot, J. H. Pratt, W. T. Longcope, R. Woodyatt, and F. W. Peabody on metabolism. A wise and critical judgement is thus assured on two subjects about which, as the editor remarks in his prefatory note, "much speculative nonsense has been written of late."

The two volumes on endocrinology begin with a section containing articles on the general aspects of the subject. Dr. Fielding H. Garrison's history of the endocrine doctrine is especially interesting and is illustrated by fourteen portraits of pioneers, beginning with Théophile de Bordeu (1722–76), a physician at the court of Louis XV, who, Max Neuburger contends, anticipated the modern conception of the internal secretions.

In an introductory article Dr. Hoskins criticizes current nomenclature, such as hormones and autocoids, but without any enthusiasm or, indeed, real suggestions for reform, except one to the effect that the names of special substances should not be finally decided until they have been isolated and chemically identified. He does not find any convincing evidence that endocrine factors play a significant part in the onset of senility; and in conclusion utters a caution against the premature construction of hypotheses about the mechanism of the internal secretions.

In his discussion of the hormone factors in growth and development Dr. E. Uhlenhuth expresses the opinion that the thymus is not concerned in the control of growth and development in spite of the rather widespread belief to the contrary; in a subsequent article Dr. Hoskins adopts a similar negative attitude with regard to its possession of a true endocrine function. Professor J. T. Halsey of New Orleans gives a comprehensive review of organotherapy in some seventy pages, leaving the subject of ovarian therapy to Dr. E. Novak. The difficult subject of the relations between the endocrine organs and the autonomic nervous system, or how the vegetative nerves influence the endocrine glands and how the chemical substances produced by these glands influence the visceral nerves, is clearly handled by Dr. F. M. Pottenger, who whole-heartedly accepts the conception of vagotonia and sympatheticotonia; the associate editor, however, has inserted a moderating footnote to the effect that, while the fundamental conception seems valuable, the want of constancy in the manifestations of these two states detracts from its clinical utility.

After these six articles of a general character the thyroid, parathyroid, and pituitary glands are considered in minute detail, several writers contributing their quota to each subject; thus Dr. E. V. Cowdry writes on the anatomy, embryology, and histology of all these glands. Although it is impossible even to mention all the contributors reference should be made to Professor Swale Vincent's article on the physiology of the thyroid, Dr. Campbell Howard's scholarly account of hyperthyroidism, including exophthalmic goitre, for which he has collected twenty additional synonyms, to Dr. Lewellys Barker's clinical syndromes due to disorders of the parathyroid glands, mainly tetany of course, which occupies more than a hundred pages, and to Dr. Harvey G. Beck's account of dystrophia adiposogenitalis.

The second volume contains the remainder of the subject of endocrinology in seventeen sections, of which that on the suprarenals and the chromaffin system, occupying 300 pages, is much the largest. Dr. Cowdry describes the anatomy, embryology, comparative anatomy, and histology of the suprarenals, and also of the other glands of internal secretion considered in the volume. Writing on the significance of the suprarenal glands in relation to the vital processes, Professor G. N. Stewart of Cleveland, who has given much time to the investigation of these problems, critically discusses the control of suprarenal secretion; faulty methods have, he says, been responsible for misleading views which, like the elaborate hypothesis of the reciprocal relations of the endocrine glands, have been accepted too readily. Nothing, he considers, is certainly known of the supposed detoxicating function of the adrenals, or the power of neutralizing toxins produced in metabolism. In a short article on the emergency function of the suprarenal medulla Professor W. B. Cannon of Harvard considers the evidence for and against his view that adrenaline secretion is stimulated by excitement, pain, and dyspnœa, and states that as yet there is no reliable proof that any secretion of adrenaline occurs in peaceful conditions. The relation of the suprarenals to the circulation is then discussed by Dr. R. G. Hoskins, and the general pharmacology and toxicology of these glands by Professor F. A. Hartman, who is also responsible for their general physiology and experimental pathology. In the section on the male and female gonads the interstitial cells are fully discussed and figured; Professor Swale Vincent, who writes on the physiology, physiological chemistry, and experimental pathology of the female gonads, considers unsatisfactory the evidence adduced in favour of the view that the interstitial cells in the testes and in the ovary belong to the same category.

Writing on the correlation of the endocrine organs Dr. R. G. Hoskins says that the assumption that all the endocrine glands are in intimate functional relation to each other has not been demonstrated to be true, and that a diagnosis of pluriglandular syndrome is often merely camouflage for ignorance. It is therefore interesting to read what Professor Walter Timme, who in 1918 described the thymus-suprarenal-pituitary compensatory syndrome, which in another work Lewellys Barker labelled Timme's syndrome, has to say in his article on the polyglandular syndromes. While admitting that the whole subject is at present more or less confused and that the syndromes are of necessity not clearly separated from each other, he gives an account of two groups which he regards as fairly well defined: first, pluriglandular insufficiency, in which the glands affected are chiefly the thyroid, gonads, pituitary, and adrenals, and of which Claude and Gougerot's type is described; and secondly, pluriglandular compensation, with an account of his syndrome with its four stages. He also deals with endocrine disorders associated with muscular dystrophies and expresses the opinion that calcification of the pineal gland is the underlying lesion of progressive muscular dystrophy.

The two volumes on metabolism are prefaced by Professor Graham Lusk's history of the subject from the earliest times; due attention is directed to the dietetic observations of William Stark (1740–70) and to the work of Mayou, who also died early; of Priestley, Black, Lavoisier, and others; the rise of German science, starting with Liebig (1803–73) and continued by Voit, Zuntz, and Rubner, is mentioned; reference is rightly made to recent work in France and America; and finally, "Across the water in that wonderful island called Great Britain are Hopkins, T. B. Wood, Halliburton, Cathcart, Leonard Hill, Hardy, E. H. Starling, and others, through whose unrecognized efforts the food program of their country was saved from disaster during the war."

The first section on dietary constituents and their derivatives begins with Dr. A. I. Ringer's article of seventy pages on the proteins and their derivatives, and this is succeeded by Professor Walter Jones's account of nucleic acids. Professor W. R. Bloor first classifies the fats and allied substances on the basis of their relations to the fatty acids in metabolism under the main heads of the simple, the compound, and the derived lipoids, and then proceeds to deal with the digestion and absorption of fats. In connexion with lipaemia he expresses the opinion that lecithin and cholesterol are stages in metabolism through which fats may or must pass before they can be utilized. The important article on carbohydrates and their metabolism, contributed by Drs. A. I. Ringer and Emil J. Bauman, first passes in review their chemistry, classification, and nomenclature and then goes on to their digestion, the question of carbohydrate tolerance, and other aspects of metabolism. In discussing vitamins Professor Carl Voegtlin concludes that very possibly they act as catalysts in some metabolic reactions, and may also indirectly

[2] *Endocrinology and Metabolism Presented in their Scientific and Practical Clinical Aspects.* By Ninety-eight Contributors; edited by Lewellys F. Barker, M.D., LL.D., (Associate Editors) R. G. Hoskins, Ph.D., M.D. (Endocrinology), and Herman O. Mosenthal, M.D. New York and London: D. Appleton and Co. 1922. [Vol. i, pp. xxii + 982, 1 plate, 190 figs.; vol. ii, pp. xxiv+995, 280 figs.; vol. iii, pp. xi+956, 84 figs.; vol. iv, pp. xii+958, 3 plates, 56 figs.; vol. v, pp. iv+879. Price £12.]

affect nutrition by stimulating the digestive organs. The article on normal diet is from the pen of Dr. Isidor Greenwald. Professor J. R. Murlin devotes a hundred pages and forty-five figures, many of them representing different forms of calorimeters, to the essential subject of the normal processes of energy metabolism.

In a most interesting account of bacterial metabolism, normal and abnormal, within the body Professor A. I. Kendall insists that diagnostic or morphological bacteriology must give place to dynamic or chemical bacteriology, and sets forth the principles of "bacterio-chemistry." The evolution of bacteria from saprophytic types through parasitic to pathogenic types appears to be attended by a well-marked decrease in the chemical activities of the microbes, and, generally speaking, intense chemical activity seems to be incompatible with pathogenicity. The specificity of action of the vast majority of bacteria pathogenic for man is held to depend upon their utilization of protein for energy; they become potentially lactic acid bacilli when growing in an environment containing carbohydrates or other non-nitrogenous products, instead of forming indol and other toxins from proteins. The effects of sugars upon the intestinal flora is a subject the author has specially investigated; thus has arisen "bromatherapy," or the treatment of certain intestinal infections so as to diminish the formation of toxic bodies from protein cleavage and to render the intestinal contents acid. Among the other articles attention may be directed to Professor H. C. Barbour's detailed account of the influence of certain drugs and poisons on metabolism, to Dr. Bock's articles on the effect of transfusion, and to Dr. T. Ordway and Professor A. Knudson's description of the effects of x rays and radioactive substances.

The fourth volume deals with pathological metabolism and is divided into two sections: the first deals with general pathological metabolism, in articles on undernutrition, obesity, acidosis, oedema, anaphylaxis, fever, traumatic shock, and disturbances of growth; the second consists of twenty-seven articles concerning special pathological metabolism, such as in diabetes mellitus, nephritis, gout, alkaptonuria, cystinuria, gastro-intestinal, hepatic, pancreatic, and other diseases. In his clear and authoritative account of acidosis, Dr. D. Van Slyke refers to alkalosis or uncompensated alkali excess in the blood, and accepts the view that it causes tetany; he adds, however, that it does not follow from this that all cases of tetany are due to the same cause; in a later article, when describing its metabolism, Dr. F. H. McCrudden discusses the possibility that alkalosis plays a part in the etiology of progressive muscular dystrophy. Carbohydrate acidosis is naturally that mainly considered in Dr. Van Slyke's article; it is also referred to by Dr. R. T. Woodyatt in his account of the pathological metabolism of diabetes mellitus. Van Slyke also summarizes existing knowledge on acidosis in renal disease, which is probably due to retained phosphoric acid; he admits that it has not yet been shown whether the moderate compensated alkali defect is important in accelerating the progress of the disease, and whether a patient in such a condition is benefited by measures to restore the alkali reserve. He cautiously expresses the opinion that, since the acid-base balance is obviously unstable and the compensated acidosis may become uncompensated, treatment on these lines may possibly be desirable; for this purpose an abundant fruit and vegetable diet which produces more alkali than acid is recommended.

Whatever the primary cause of oedema, whether renal insufficiency, damage of the capillaries, or disturbance of metabolic processes in the tissue cells, the problem of oedema is that of the interchange of fluid, with its dissolved and suspended substances, between the blood and the tissues, and accordingly Professor Franklin C. McLean discusses these at length; in some remarks on the treatment of oedema he describes the administration of thyroid extract in myocardial disease and chronic parenchymatous nephritis; this is recommended by Eppinger and Epstein when they advocate a diet rich in proteins and poor in fats for patients with chronic parenchymatous nephritis. Fat metabolism and the blood lipoids in nephritis are considered in the course of Dr. H. O. Mosenthal's valuable article dealing with metabolism in nephritis. Dr. Joseph H. Pratt of Boston, whose name is well known in connexion with gout, writes fully and impartially on its metabolism and gives useful summaries of the opinions held about the treatment by diet and by atophan. In an elaborate article on the important subject of the pathological metabolism of the blood and the blood-forming organs, Dr. S. Hurwitz first reviews the recent work on blood destruction and regeneration, then discusses the metabolism in blood diseases, and finally considers the influence on metabolism exerted by some measures, such as splenectomy, x rays, and radium, employed in the treatment of blood diseases.

It must be gratefully recognized that these volumes contain an immense store of information, contributed by authoritative writers from a country where their investigation has been widely and energetically carried on, and that the editors' labours therefore are most welcome in having thus provided us with a valuable source of reference.

DISEASES OF CHILDREN.

The Diseases of Children, Medical and Surgical, by the late Dr. Henry Ashby and the late Mr. G. A. Wright, was a valuable and popular textbook on the subject which reached its fifth edition in 1905. A sixth edition now appears.[3] The medical chapters have been revised by Dr. Hugh T. Ashby; the revision of the surgical matter which had not been finished by Mr. G. A. Wright at the time of his death has been completed by Mr. Charles Roberts. The character and aim of the book is still well described in a paragraph of the preface of the first edition: "The original feature of this book is that it is written conjointly by a physician and a surgeon; it is hoped that it presents therefore a fairly complete account of disease in children. Though we are well aware that the book is not an exhaustive treatise we think it will be found practical, and it is at least based on experience and is not a mere compilation." The successful career of the book through several editions was the best proof of its useful and practical character, and the present edition will, we think, maintain its reputation. As to the inclusion of medical and surgical diseases in one volume, that still remains an original feature. Almost all the diseases incident to infancy and childhood are dealt with, for, besides surgical and medical conditions, the infectious fevers, affections of the ear, nose, and throat, and of the teeth, are all included. This range of subject-matter is rather that of an encyclopaedia, and it could only be compressed within the limits of a book by a concise and essentially practical treatment of the individual diseases. The new edition is of rather smaller bulk than the old, so that it retains the original character of brief and summary statement, in which the more important conditions are dealt with in a few pages, while rarer diseases are sketched in a short paragraph. That leaves little room for theories of etiology, for accounts of pathology, for references to authorities; but room is found in a praiseworthy way for the citation of a few telling and illustrative clinical records. Yet, while this severe and almost dangerous brevity is the outward mark of the book, its soul is the very large individual experience of the late authors; and its success and reliability rest upon that secure foundation. The claim in the original preface that it is not a compilation is fully justified. It is a book that may be safely commended to the busy practitioner—a brief working manual for the demands of daily practice, where within the covers of one volume he may find short but trustworthy guidance to the diagnosis and treatment of the very numerous and various conditions of disease incident to childhood. The volume is well illustrated, and, though the number of illustrations has been reduced in the new edition, many new ones have been included, and there is a good index. The revisers are to be congratulated on their success in the difficult task of bringing the new volume up to date while preserving the spirit and character of the old. We anticipate that this well-known book will continue its honourable and useful career.

The aim which Dr. L. W. Hill tells us he had before him in preparing his book on *Practical Infant Feeding*[4] was to produce a volume "practical without being superficial, scientific without being tiresome." On the subject of infant feeding the aim is laudable, but not easily to be attained: the subject is full of difficulties. Chemical and physiological data are copious and exact, but not as yet securely linked with the clinical data; pathology is obscure, and the whole ground is

[3] *The Diseases of Children, Medical and Surgical.* By the late Henry Ashby, M.D., F.R.C.P., and the late G. A. Wright, B.A., M.B., F.R.C.S.; revised by Hugh T. Ashby, B.A., M.D., M.R.C.P., and Charles Roberts, M.B., B.S., F.R.C.S. Sixth edition, thoroughly revised and rewritten. Oxford Medical Publications. London: Henry Frowde, and Hodder and Stoughton. 1922. (Demy 8vo, pp. xxvii+769; 202 figures. £2 2s. net.)

[4] *Practical Infant Feeding.* By L. W. Hill, M.D. Philadelphia and London: W. B. Saunders Company. 1922. (Med. 8vo, pp. 483; 40 figures. 24s. net.)

covered with a tangle of conflicting theories. The author devotes some preliminary chapters to the physiology and bacteriology of digestion in infancy, to the analysis of human milk, and to the rules for breast feeding. He then enters the debatable ground of artificial infant feeding. He begins by giving a short historical sketch of the various theories with their corresponding applications in treatment, dealing in succession with percentage feeding and the exact adjustment of milk mixtures advocated by Biedert, Meigs, and Rotch; with the bacteriological teaching of Escherich; with the views of Czerny on milk fat; and with the latest chemical theories of Finkelstein as to the influence of the sugar and the salts in cow's milk. Dr. Hill is unwilling to discard entirely any of these theories, contradictory though some of them may appear to be; he maintains that in each there is a precious residuum of truth, which modern practice can make use of. This is an attitude of mind favourable to the reception of truth from whatever point of the compass it may come. But it has its dangers; and this book shows signs of them, while the history of the subject abounds in instances. The attitude is facile, and those who take it are apt to be carried about by any wind of doctrine blowing now from America, and next from Central Europe. The author in his practice of artificial feeding favours a milk mixture low in protein and salts, but fairly high in sugar and fat; he obtains the result he desires by the use of gravity cream and skimmed milk. It should be said that the book does not contain any clinical records of healthy or dyspeptic infants to illustrate and prove the theories and doctrines of feeding that are discussed. This lack of clinical illustration detracts not a little from its value.

The chapter on premature infants is written by Dr. W. H. Howell; and there are chapters on diarrhœa, chronic intestinal indigestion, constipation, pyloric stenosis and spasm, rickets, scurvy, and spasmophilia.

A SYNOPSIS OF SURGERY.

THE sixth edition of HEY GROVES's well-known and deservedly popular *Synopsis of Surgery*[5] has just been published. The success which this book has attained is the result of its excellent plan, rendering it exceptionally lucid in its brief descriptions. There is no doubt that the author expended a vast amount of labour on the first edition, and he chose his authorities wisely and well. Indeed, when this book first appeared its teachings were in advance of many of the text-books of the day. The sections on those subjects of which Hey Groves is admittedly a master have been brought up to date. But there are others that need more careful revision, and use might have been made of many of the valuable monographs which have appeared during the past few years, largely in the journal which Hey Groves himself edits. In many instances no more than a sentence would have been needed to mark a definite advance in our knowledge. More stress, for instance, might have been laid on appendicular obstruction in the etiology of acute appendicitis; and the colicky pains widespread across the abdomen which herald the onset of an acute attack are not mentioned.

In spite of some defects, the book remains a good one because its principles are sound. But we trust that more radical revision of some sections may be instituted in future editions, lest the book in time should lose the enviable position which it has held in the past.

MORBID FEARS AND COMPULSIONS.

IN his volume on *Morbid Fears and Compulsions*[6] Dr. H. W. FRINK gives a readable and comprehensive account of the theory of psycho-analysis and its practical applications in the treatment of the psycho-neuroses. He follows closely the teaching of Freud, and expresses himself as having but little sympathy with the post-analytic schools of Adler and Jung. Beyond the fact that Dr. Frink suggests the substitution of the term "sexual" by the broader one "holophilic," the earlier chapters which deal with general principles are written on familiar lines, and thus suggest no special comments. The more recent developments of the libido theory and its applications to the psychoses are not discussed. This may be due to the fact that this book was first published in America in 1918, so that the author was at that time unacquainted with Freud's most recent views. In any case these latest developments are chiefly of interest to the advanced student of psycho-analysis, and do not conflict with the details included in this volume. Later chapters in the book are devoted to an account of cases of compulsion neurosis and of anxiety hysteria. The author explains that these cases fail to illustrate in certain particulars the theories he has discussed in earlier chapters; he points out that a completely analysed case could not have been compressed within the limits of his book, and he proposes to write a supplementary volume which will be devoted to a single case report. The last chapter is concerned with a discussion of the theory and mechanism of the psycho-analytic cure.

The volume has the advantage of an introduction by Dr. J. J. Putnam, in which he discusses what he considers to be the defects and limitations of Freud's doctrines of the human mind, his criticisms being directed more especially to the mechanistic philosophy upon which they are based. The book may be recommended to those who wish to obtain a systematic and more than elementary account of the subject with which it deals.

THE SECOND HALF OF LIFE.

Senescence: The Last Half of Life[7] is the latest fruit of the full life of the well-known psychologist, G. STANLEY HALL, President of Clark University, and its publication follows his retirement from that post. It describes old age and death from many points of view, but its main object is the demonstration that intelligent and well-preserved senectitude has important social and anthropological duties in the modern world, though hitherto these have not been utilized or even recognized; thus, with the passing of sexual activity and of ambition for place and fame there comes, he says, an Indian summer of increased clarity and efficiency in intellectual work and a philosophic calm. Writing in a genial autobiographical strain he expresses his frank conviction that the medical profession knows little of old age, that there are no gerontologists, as there are paediatrists and gynaecologists, that centenarians owe their longevity much more to their own insight than to medical care, and therefore that for the most part the old man must be his own doctor. A chapter, however, is devoted to a useful and judicious abstract of various medical men's views on the changes and treatment of old age. In a critical estimate of Metchnikoff's well-known views he praises the optimism and intentions that stimulated his writings, but regards the value of sour milk as overestimated. The rejuvenating effects obtained by vasectomy by Steinach and by transplantation of the testis by Voronoff are fully described, and the author concludes that the only practical hope of relief from the hardships of senescence and of the postponement of death is that now faintly and tentatively arising and suggesting that some mitigation may be obtained by glandular implantation, or perhaps even by the injection of the secretions of endocrine glands. Dr. Stanley Hall analyses the returns he obtained from a set of questions addressed to a few score of mostly eminent and some very distinguished elders of the United States. To the question, "To what do you ascribe your long life?" the reply most often given was good heredity, and then "the preservative influence of good and temperate habits, reinforced by observation of acquaintances of early life who, by reason of less moderation, have preceded them to the cemetery."

This is an interesting volume, at least to those whose "way of life is fall'n into the sere, the yellow leaf," and has many pleasing personal touches.

THE WORKMEN'S COMPENSATION ACT.

DURING the war two Acts were passed increasing the amount of compensation payable to an injured workman under the Workmen's Compensation Act, 1906, but no other material changes were effected in the original Act. In the second edition of his book on *Medico-Legal Examinations and the Workmen's Compensation Act*,[8] Sir JOHN COLLIE has accordingly reprinted the first edition without change, and added to

[5] *A Synopsis of Surgery.* By Ernest W. Hey Groves, M.S., M.D., B.Sc., F.R.C.S. Sixth edition. Bristol: John Wright and Sons, Ltd.; London: Simpkin, Marshall, Hamilton, Kent, and Co., Ltd.; Toronto: The Macmillan Company of Canada, Ltd. 1922. (Cr. 8vo, pp. 621; 23 figures, 13 plates. 17s. 6d. net.)

[6] *Morbid Fears and Compulsions: Their Psychology and Psycho-analytic Treatment.* By H. W. Frink, M.D., Assistant Professor of Neurology in Cornell University Medical College. With an introduction by James J. Putnam, M.D. London: Kegan Paul, Trench, Trübner, and Co., Ltd. (Demy 8vo, pp. xxiii + 344. 21s. net.)

[7] *Senescence: The Last Half of Life.* By G. Stanley Hall, Ph.D., LL.D. London and New York: D. Appleton and Co. 1922. (Pp. xxvii + 518. 21s.)

[8] *Medico-Legal Examinations and the Workmen's Compensation Act, 1906, as Amended by Subsequent Acts.* By Sir John Collie, C.M.G., M.D., J.P., Lieutenant-Colonel R.A.M.C. Second edition. London: Baillière, Tindall, and Cox. 1922. (Demy 8vo, pp. 157. 6s. net.)

it some twenty-eight pages in which he has briefly considered the effect of war pensions on compensation, the employer's liability to pay compensation to a man in prison, and some recent decisions which throw light upon the fundamental intentions of the Act of 1906. This method of procedure is not entirely satisfactory, as it necessarily leaves in the new edition various statements which are now out of date or require modification—for example, the statistics given in various places nowhere relate to a year later than 1909. Further, the decisions given in what are known as the "wall" case and the "air raid" case go far, as the author points out, towards finally and clearly defining the intention and scope of the Act, and consequently now render superfluous the considerable space which Sir John Collie devoted to the discussion of these questions in the first edition.

In spite of this defect, however, the book can be cordially recommended to practitioners who are concerned with compensation cases, while medical referees under the Act will find much of interest in the author's suggestions for improving the Act.

The earlier part of the volume contains many examples of clever malingering, and accounts of the skilful methods of detection which the author has made so peculiarly his own. The suggestions for amendment of the Workmen's Compensation Act are all in the direction of increasing the powers of medical referees to decide issues of a purely medical nature, and will receive the assent of the medical profession. Under the law as it stands at present a case may only be referred to a medical referee on the application of both parties. The result naturally is that the side which has doubt about its position refuses to apply, and accordingly very few cases are so referred. The author's proposal that the matter shall be referred to a medical referee on the application to the court by either party is one which will be strongly endorsed by all who have had experience of these cases.

The author also calls attention to the fact that in many cases where medical points are at issue the judge still fails to summon a medical referee to sit with him as an assessor, although most of the cases turn upon medical evidence which is technical and may be conflicting. Sir John Collie's recommendation—that if either party desires to have a medical referee sitting as assessor, the judge should be compelled to grant the application—is entirely sound.

The interesting accounts given of some recent decisions, though more of legal than of medical importance, show that the author keeps himself in touch with events. The book is clearly written and should prove useful to those interested in the subject.

NOTES ON BOOKS.

IT is little more than a year ago since we welcomed very warmly the appearance of the Report of the Departmental Committee appointed by the President of the Board of Education to inquire into the position of English in the educational system of England.[9] No one can feel more strongly than we do the importance to the student of medicine of a good general education as a foundation for technical knowledge and for the exercise of a liberal profession. We believe, with the authors of that report, that a command of his own language should form an indispensable element in the training of the citizen, and we hold that this applies with peculiar force to the training of the medical practitioner. English, so much neglected in the past, is the essential basis of a liberal education for all Englishmen, and in a special degree for members of our profession. The present condition of English in schools is admittedly most unsatisfactory, and the reasons for this were stated at length in the Report; one defect—in schools where English is taught as a "subject"—is the undue stress laid upon formal grammar. Among recent school books which seem to show a movement in the right direction—that is, towards the inculcation of a living interest in the mother tongue, both as a means of precise communication and as a mode of artistic expression—we may mention *English Literature: The Rudiments of its Art and Craft*,[10] by Mr. E. V. DOWNS, of which the second edition has lately come to us for notice. We have not space to discuss the plan and scope of this little work, and will only say that it appears to us to possess the great merit of being written by one who loves literature for its own sake and seeks to convey his enthusiasm to the pupil. For this reason certain shortcomings will readily be overlooked by the fastidious student of English. No disparagement is meant when we express the opinion that an intelligent youth will get very much more good than harm from this agreeable introduction to the technique of English composition.

The *Annual Charities Register and Digest* published by the Charity Organization Society gives information, which cannot be found in the same form elsewhere, for those who occupy themselves in charitable work of any kind, more especially in London. The thirty-first edition, for 1922, which has just been issued[11] will be found as useful as its predecessors. It gives a classified list of all the institutions, societies, and bodies, in or available for the metropolis, which can be approached for relief in cases of affliction or distress, whether of body, mind, or estate. The detailed information is prefaced by a short summary of institutional finance during 1920, and here is pointed out the impossibility of drawing a sharp line between London charity and provincial charity. Particular care has again been taken to make the index both accurate and comprehensive.

The Charity Organization Society has issued simultaneously a smaller work entitled *The Prevention and Relief of Distress*,[12] being a handbook of information respecting the statutory and voluntary means available for the relief of distress and the improvement of social conditions. This embodies most of the material formerly contained in Sir Charles Loch's introduction to the *Charities Register and Digest*, entitled, "How to help cases of distress," and it is intended to be used as a reference book in conjunction with the *Register*. The aim is to supply the social worker or student with a working knowledge of the organizations, whether State, municipal, or voluntary, which deal with the relief of distress; to co-ordinate the information which should be familiar to persons administering relief; and to set forth principles and methods which experience has proved to be sound. Like the companion volume it is written principally from the point of view of the London worker, but a good deal of the material has a far wider application.

[9] BRITISH MEDICAL JOURNAL, September 24th, 1921, p. 495.

[10] *English Literature: The Rudiments of its Art and Craft.* By E. V. Downs, M.A. Senior English Master, High School for Boys, Newport, Mon. Second and revised edition. London: Hodder and Stoughton. 1922. (Cr. 8vo, pp. viii+295. 4s. 6d. net.)

[11] London: Longmans, Green, and Co., and Charity Organization Society. 1922. (Demy 8vo, pp. xx + 554. 7s. 6d. net.)

[12] London: P. S. King and Son, Ltd., and Charity Organization Society. 1922. (Cr. 8vo, pp vii + 140. 2s. 6d.)

MEDICAL AND SURGICAL APPLIANCES.

Twin Needle Outfit for Collecting Blood from a Vein.

DR. A. CAMBELL (Medical Officer in Charge V.D. Treatment Centre, The Royal Portsmouth Hospital, Portsmouth) writes: Although the ordinary method of collecting blood from a vein by puncturing it with a needle and allowing the blood to flow into a test tube is quite a simple operation, it is sometimes difficult for the inexperienced to do it quickly and cleanly. Without a good deal of practice it is not easy to hold the needle and the test tube with the fingers of the same hand. I have devised a simple outfit which provides a rigid connexion between the needle and the test tube and at the same time ensures the blood being collected in a sterile manner. Soldered parallel to the needle is a tube of similar diameter but shorter in length. Attached to the two is a flat metal plate forming a winged grip. The twin needle is passed through a perforation set eccentrically in a rubber bung, which

fits tightly in a test tube of appropriate size. The object of the additional tube is to allow an exit for air to pass out as the blood flows into the tube. Holding the test tube, the point of the needle is plunged into the vein and the blood allowed to flow until the requisite quantity is obtained. After withdrawal of the needle it is removed from the bung by twisting and pulling on the grip gently, the bung then being pushed firmly home. The pressure of the neck of the test tube closes the perforation and prevents leakage. The length of the test tube is convenient for centrifuging and the outfit is enclosed in a wooden box and can be sent safely through the post. The outfit has been made for me by Messrs. Down Bros.

Soloid Urine Analysis Reagents.

Messrs. BURROUGHS, WELLCOME AND CO. have placed on the market a very handy set of six "soloid" urine analytical reagents neatly packed in a cardboard box. The reagents consist of citric acid, Fehling's test, the indigo test for sugar, picric acid, potassium ferrocyanide, and salicyl-sulphonic acid. A circular included in the package gives instructions as to the use of the "soloid" reagents. The outfit is very complete and compact; the only criticism to be offered is that the soloids do not dissolve very rapidly unless previously crushed into powder. In every other respect the collection of reagents satisfies all the claims put forward by the manufacturers.

MOTOR NOTES FOR MEDICAL MEN.

By H. MASSAC BUIST.

THE MOTOR CAR SHOW IN LONDON.

Whereas the majority of the passenger cars shown at the recent exhibition in Paris were the identical vehicles that appeared in the same building twelve months ago, in the case of the sixteenth International Passenger-Car Show that opened on Friday, November 3rd, under the patronage of the King, at Olympia, Kensington, and the White City, Shepherd's Bush, London, there is practically not one vehicle, or chassis, staged which appeared last year. Though split into two buildings, as in Paris, the display in London differs from the French inasmuch as the latter contained pedal bicycles, motor bicycles, commercial motors, and marine motors, as well as motor cars and all manner of accessories, whereas the British one is confined solely to passenger cars and accessories for them. The exhibition in London, which will be open until Saturday, November 11th, is, too, of a more international character than the French exhibition, and much more so than any of the American shows, or than the German and other displays on the continent of Europe. All cars of note introduced to the public in Paris are shown in London, and the American industry is represented by nearly all its notable products; none of the few abstainers have new models of note embodying fresh ideas in regard to construction. By way of indicating at once the sheer variety of fresh material for consideration, I may mention that quite new models are introduced by the following firms among others: Argyll, Ariel, Aster, Austin, Angus-Sanderson, B.S.A., Bianchi, Bignan, Calthorpe, Case, Clyno, Coventry Premier, Crossley, Crouch, Delage, Delaunay-Belleville, Daimler, de Dion Bouton, Enfield-Allday, Ensign, Crown Ensign, Excelsior, Fiat, G.N., G.W.K., Gwynne, Humber, Hurtu, Lancia, N.P. (Salmons and Sons), Palladium, Paige-Jewett, Phoenix, Renault, Rover, Ruston-Hornsby, Singer, Straker-Squire, Sunbeam, Swift, Seabrook, Star, Talbot, Trojan, Turner, Unic, Vauxhall, Wolseley.

A New Chapter in Cheaper Motoring.

Novelties, however, are not to be found solely in regard to new models. No less important a feature of this display is the evidence it affords of a complete change of conditions in regard to prices. A number of models of up-to-date design have been notably reduced in price despite the fact that they are being made better now because another year's experience of the cars in the hands of the public has been gained, and because in many cases they have been improved in regard to the details of design and equipment; such changes, though not sufficiently radical to constitute them wholly new models, are, nevertheless, sufficient to justify their being described as essentially 1923 products. The best way to indicate the scale of reductions is to select some prices for this year's improved products in respect of cars coming within the power and purse ranges likely to concern the average medical man. The facts are set out in tabular form in the next column.

The visitor to the British show who wishes to make himself acquainted with all the material offered within the range likely to be of interest to him will not be able to visit either Olympia or the White City separately and consider that he has seen all that will interest him as would have been possible had he gone to the French show, where the division of the exhibits was strictly logical in that no machine having an engine of 1,100 c.cm. or less was eligible for display in the Grand Palais, and all the small-engined cars were displayed in ancillary buildings. The classification in London is solely by the luck of the ballot, so that the prospective buyer interested in any one size of car will have to go to both buildings in London. The arrangement is extremely inconvenient, but the Society of Motor Manufacturers and Traders had contracted for Olympia, which is in process of enlargement, and it was anticipated by some, though never by myself, that the work would be sufficiently far forward to enable all the vehicles for display to be housed within that building. A couple of months ago, however, it was plain that this was impossible, and it was decided to split the exhibition between the two buildings. The visitor, however, may be assured that next year it will be possible to get all the vehicles in the one building. Meantime, what with the reduction in petrol prices and in tyre and car costs, with consequent saving in the total sums of money for which vehicles have to be insured,

Tax.	Make.	Chassis Price.		Car Price.		
		Former.	Present.	Seats.	Former.	Present.
£		£	£		£	£
16	Wolseley	—	500	4	795	660
16	Sunbeam	750	700	5	960	895
16	Ruston-Hornsby..	—	—	5	585	475
16	Arrol-Johnston ...	—	—	4	650	550
14	Vauxhall	550	420	4	750	595
14	Standard	—	—	4	525	450
14	Rover	495	415	4	650	550
14	Fiat	550	510	4	800	710
14	Calcott	—	390	4	650	575
13	Sunbeam	575	535	4	725	685
13	De Dion	495	415	4	610	525
13	Austin	—	—	4	550	450
12	Talbot-Darracq ...	470	420	4	575	525
12	Swift	—	—	4	575	495
12	Bean	320	285	2	385	335
12	Albert	350	320	4	448	375
11	Wolseley	—	305	2	475	380
11	Hillman	—	350	2	630	430
11	Fiat	410	365	4	550	495
11	Calthorpe	—	—	4	450	357
10	Standard	—	—	4	315	295
9	Wolseley	—	—	2	295	255
9	Stoneleigh ...	—	—	3	225	185
9	Rover	—	—	2	220	180
8	Talbot	—	—	2	350	295

and the improvements incorporated in the various machines, it is plain that there is ample material for inspection on the comparative basis, which is the quickest way of becoming acquainted with what may be styled relative degrees of merit.

New Models are Smaller Types.

As far as I have been able to discover—one cannot make sure until the doors of the exhibition shall have closed, so vast is the quantity of material for review—there is but one exception, the B.S.A., to the rule that every entirely new model introduced this year is smaller in regard to engine size, and cheaper in regard to price, than any previously on the given car builder's list. This is a noticeable tendency, as may be judged from the fact that when the first post-war exhibition was held the first thing to strike the visitor was that makers seemed to have vied with one another in the production of large models, the endeavour being apparently to see who could introduce the most costly chassis. Another point of direct interest to the medical man is that, when one speaks of the list price of a two- or of a four-seater car nowadays it is understood that that sum includes what is styled all-weather equipment—that is, hood scheme embracing side curtains and opaque panels opening and closing with the doors. Humber gives a further lead by standardizing all models with double wind screens and double-acting nickel and rubber wipers. These are of such appreciable service to the medical man that it is important to know that they can be obtained now for a fixed sum, which in practically all cases is less than the cost of the given models without such equipment twelve months ago. The chief causes for the fall in costs are the changed attitude of labour and reduced transport and raw material charges, though there are other factors, such as better manufacturing methods, better distribution and organization, and so forth. There is, however, one rather disconcerting trend against manufacturing progress as demonstrated by America in the policy of "one firm, one model." We had worked in Britain a long way towards that by the time war broke out, and there were indications that our experience of manufacturing during the war had led us to discover the value of that policy as applied to motoring; but events have not fulfilled this hope, and we find a large number of firms

this year introducing multi-model programmes of even more embarrassing variety than any known before the war; and a large number of firms are increasing their already large range of models. For example, for 1923 Austin increases his models from two to three, as he did last year from one to two. Again, Wolseley adds yet another to a programme that now embraces no less than six main chassis types. Of course, all this is because our export markets have been closed and we have had to try to sell more vehicles at home.

The Three New Engine Sizes.

In regard to taxation costs it is at least assured that there will be no change in the basis of arriving at horse-power for the purpose of Treasury rating. The Society of Motor Manufacturers and Traders decided months ago that no matter what happens in regard to the proposed reduction of the proportion of revenue to be raised from horse-power taxation if one of the schemes recommended—namely, that of a petrol tax—should go through, thereby bringing us back to a dual tax, nevertheless the basis of the Treasury rating of engines shall remain what it is to-day. Therefore the question whether to buy, say, a large-engined, cheap American car, or a small-engined, moderate-priced European car, is unaffected because the proportion of the tax payable in respect of the engine rating will remain exactly the same in ratio. Hence incidentally there is no likelihood of a taxation scheme affecting materially the trend of car development as represented by engine design. Whereas at the French show it was discovered that a number of what may be called the small fry in the industry—many not known here fortunately—are staking their all on what we would call the cycle car, there is very little evidence of that in the London show. British manufacturers seem to be intent on the evolution of the small car proper. While for competition purposes our organizations have persisted overlong in dividing small cars into those having engines not exceeding 1,500 c.cm. (91½ cubic inches) and those having engines not exceeding 1,100 c.cm. (67¼ cubic inches), manufacturers standardizing cars of the smaller classes choose to take 1,000 c.cm. (61 cubic inches) as the natural limit for a new class—the 1-litre class, and the 1½-litre class, supplementing the 2-litre or 122 cubic inches class that is also very popular, alike on the Continent and in this country. A number of Continental manufacturers are producing engines of the 2-litre class, and of the 4-cylinder type in particular, which come out in the main at between 10-h.p. and 12-h.p. rating, though some others would involve the payment of a yearly tax of £14 and even £16 under the present scheme.

Overloading.

In regard to the 1,500 c.cm. engined class, it was noted last year that there was a tendency to overload these types, chiefly because, where the engine was really efficient, the chassis were sometimes not made strong and large enough to take the ambitious bodies supplied. In this class to-day, however, there is not so much evidence of overloading. A very interesting further development this year is that not only are there more 6-cylinder engines in the 2,000 c.cm. (122 cubic inches) class, but there are also some very notable 1,500 c.cm. (91½ cubic inches) 6-cylinder engines, as witness, particularly, the 6-cylinder overhead-valve engined Talbot (£12 tax). Another small 6-cylinder in this class is the 12-h.p. Daimler of the double-sleeve valve type. There is also the 6-cylinder side-valve A.C. model. Though these are smaller 6-cylinder engines than we have had hitherto, they do not represent the extreme to which manufacturers have gone. For example, from Alsace there come two versions of the Mathis—one a 6-cylinder overhead-valve engine of 1,188 c.cm. volume, and the other a 6-cylinder side-valve engine type of 1,140 c.cm. volume. But these are rather exceptional propositions than otherwise. On the other hand, that the very small engine is regarded as a commercial proposition by British manufacturers is suggested by the introduction by Sir Herbert Austin of an £8 tax, 698 c.cm., side-valve, 4-cylinder, water-cooled engined small car with single-plate clutch, gearbox embodying three speeds forward, spiral bevel-driven back axle, transverse front spring, quarter elliptic rear springs, dynamo lighting, mechanical starter operated from the seat, and all-weather body to seat two adults, a child, and luggage, and interchangeable brakes to all four wheels; the whole scales some 6½ cwt., and is listed at £225. This is an attempt at a new type of utility car. Rover, again, introduces a developed version of the well-established £8 tax, air-cooled, 2-cylinder chassis equipped with a four-seater body to hold two adults and two children, or adjustable to accommodate two adults and an ample proportion of luggage—the whole listed with all-weather equipment complete for £190. In yet another direction we find the Armstrong-Siddeley organization producing, through a subsidiary concern, the Stoneleigh utility three-seater air-cooled car, that did so well in the Royal Scottish Automobile Club's trial; this £9 tax machine is listed this year, complete with clover-leaf three-seater body, adjustable for carrying luggage, for £185, as compared with £225 last year.

New British Car Builders.

There is also evidence in the Show of a quite unexpected tendency—an increase in the ranks of chassis producers at a time when, one would imagine, most folk would be extremely chary of embarking on such an enterprise. Yet some of it is in the nature of an almost logical development, as for instance the enterprise of the Aster Engineering Company, which for twenty-two years has produced power plant of all sizes that have been used in a vast number of cars of different names; this year it introduces a complete vehicle—a 6-cylinder £18 tax 2,618 c.cm. tubular pushrod and rocker operated overhead-valve engined chassis wherein the valve seats are water cooled and aluminium pistons are used; the cylinder head design is a result of the firm's investigations into the problem of turbulence. This power plant has 1.23 mean effective pressure at 3,000 crankshaft turns a minute, and can be run from 170 to 3,200 r.p.m. The £585 chassis has a four-speed gearbox controlled by interlocking selector pins; weighs 16½ cwt., and the brake horse-power of the engine is 55 at 3,000 crankshaft turns a minute. Gwynne's, who manufacture the Albert car, now introduce an £8 tax 950 c.cm. pushrod and rocker operated overhead-valve engined Gwynne car, the 4-cylinder power plant of which is distinctive by reason of the use of aluminium pistons and wick feed lubrication to the valve rockers. This chassis has a three-speed, constant mesh gearbox, mounted on the torque tube, the car being marketed, complete with clover-leaf coachwork, for 198 guineas. Again, the old-established coachbuilders, Salmons and Sons, of Newport Pagnell, now bring forward a chassis styled the N.P. (presumably standing for Newport Pagnell), the coachwork being notably superior to the average standardized. This is a £12 tax 1,795 c.cm. machine with pushrod and tappet operated overhead-valve 4-cylinder engine; full cantilever rear springs and special means of taking up wear in the back axle bearings; the car complete with four-seater body being listed at £525, and as a two-seater at £495.

Chiefly Concerning New Models.

Regarding the Show in its international aspect, some of the outstanding features in quite new models of cars introduced by established makers may be touched on briefly. Thus the 1,693 c.cm., 4-cylinder, overhead-valve engined Bignan is distinctive in having Hallot-Servo brakes operating on the front wheels, and no brakes acting directly on the rear wheels. Proceeding in alphabetical order, Crossley introduces a 2,388 c.cm., 4-cylinder, water-cooled, side-valve engined chassis with three-speed gearbox, selling at the price of £475, complete with body and equipment. The 12-h.p. Delage is a small car with a complete four-wheel braking system; as is the 2,614 c.cm. Delaunay-Belleville with nickel-steel overhead-valve engine. In the latter case the Perrot diagonally controlled front wheel brakes act in synchronism with the transmission brake, the hand-controlled brake acting independently directly on the rear wheels. Crouch introduces a 1,248 c.cm. 4-cylinder car to sell at £235 as a two-seater, the chassis being equipped with a 4-cylinder Anzani engine with aluminium pistons. From Belgium comes the 6-cylinder, 5,343 c.cm., overhead-valve engined Excelsior car, of the type supplied to King Albert, and having Adex diagonally controlled, cable-operated brakes to all four wheels. The increasing use of aluminium pistons is illustrated in the 3,308 c.cm. pushrod operated overhead-valve 4-cylinder engined de Dion Bouton, which has four wheel brakes and cantilever rear springs. Pushrod and rocker operated overhead valves are also used on the 2,485 c.cm. 4-cylinder de Dion Bouton chassis which is available with or without brakes to all four wheels, at option.

For £275 Humber introduces a 985 c.cm., water-cooled, overhead inlet valve, side-by-side exhaust valve, 4-cylinder two-seater, with detachable seat for carrying two children or ample luggage, and with all-weather equipment. The 990 c.cm. 4-cylinder Angus-Sanderson (£275) is a two-seater type with dickey. Both the large Humber chassis, previously standardized, are brought forward this year with engines having the new style of valve system. All three models are standardized, with double wind screen and double-action nickel and rubber wiper. A new Singer model with a 4-cylinder, pushrod operated, overhead valve, 1,096 c.cm. water-cooled engine, and the Coventry Premier, with the

same size and type of engine, are introduced, the former having magneto and the latter dynamo and battery ignition. The Straker-Squire car shown comes within the 1½-litre class, being a 1,460 c.cm., pushrod and rocker lever operated overhead valve 6-cylinder engined chassis, with gearbox having four speeds forward and with semi-elliptic springs fore and aft, the whole selling as a two-seater complete for £425. A sports version of the nominal 14-h.p. Sunbeam car with overhead valve 4-cylinder engine, of 1,954 c.cm. volume, is introduced this year to give greater power; a special carburetter, inlet piping, and pistons are furnished, the vehicle achieving a maximum speed of over 65 miles an hour on the flat, and the chassis being marketed at £585. Swift has produced a quarter elliptic sprung four-seater, with a 4-cylinder, side-valve engine of 1,037 c.cm. volume.

MISCELLANEOUS NEW SCHEMES.

In the 1½-litre class, the aforementioned 6-cylinder overhead-valve engined 1,454 c.cm. Talbot chassis is listed at £465, and with 4/5-seater body and all-weather equipment at £575. In addition to fitting the large 28–90-h.p. Vauxhall with an overhead-valve engine, a nominal 23–60-h.p. entirely new chassis is introduced this year; it has 3,969 c.cm. push-rod operated overhead 4-cylinder valve engine, the chassis scaling 23 cwt., having four speeds forward, and being listed at £1,150 complete. Ruston-Hornsby introduces a 2,614 c.cm. 4-cylinder and a 3,308 c.cm. 4-cylinder side-valve engined chassis of conventional design, to sell at £525 and at £575 respectively, with 4/5-seater body in each case. The new 1,469 c.cm. Seabrook sports model has an overhead-valve Meadows engine. The Star Company of Wolverhampton introduces a 2,169 c.cm. side-valve engined 6-cylinder nominal 18 h.p. car with two interchangeable cylinder heads, each covering three cylinders only; a crankshaft equipped with integral balance weights; a single dry-plate clutch; and a gearbox providing four speeds forward. Wolseley supplements its list of models by bringing forward a side-valve engined, nominal 14-h.p., 4-cylinder family car of 2,613 c.cm. engine volume, listed complete with 4/5-seater coachwork, for £525 only. Argyll introduces a 1,496 c.cm. 4-cylinder single-sleeve valve engined chassis, with four-speed gearbox, controlled centrally, to sell as a four-seater touring car at £495.

Among the small disc adhesion driven types of cars, G.W.K. has an interesting development this year in bringing forward a type wherein the driving disc is fashioned of aluminium and has triple section cork insertions, divided by thin aluminium rings, round the periphery; thus it is hoped to prevent warping, or bursting, of the discs, and to deal also with the heat problems involved. From France comes the 12-h.p. 4-cylinder Unic with newly designed front axle, rear cantilever springs each set above a quarter elliptic spring; mechanical tyre pump incorporated with the gearbox; and pedal-operated dustproof front wheel brakes functioning in conjunction with the brake on the propeller shaft, the wearing surfaces being supplied automatically with lubricant each time the brakes are applied.

FRONT WHEEL BRAKE DEVELOPMENTS.

Sunbeam introduces a developed form of the £24 tax, 4,824 c.cm., pushrod operated overhead valve, monobloc, 6-cylinder engine chassis with pedal operated Servo motor bolted on to the gearbox. By this means large diameter brakes are applied to all four wheels on the Perrot diagonal system, the front drums being ribbed like the rear ones for cooling. The front axle is designed specially to take the torque, or twisting strain, of brake application. The one piece stamping has an I-section between the two springs, but takes a circular form from, and including, the spring pads outwards to the stub axle; this design is the result of experience in racing; it is the first standardized car to deal with the exceedingly important problem of braking strains. In like fashion Fiat introduces a 26.9-h.p. 6-cylinder overhead-valve engined model wherein the gearbox is used for the hydraulic application of the brakes on the principle of Servo mechanism, which may be described, broadly, as centrifugal force. But the Fiat design is distinctive because, should the gearbox be starved of oil through neglect or any other cause, it would nevertheless be possible to supply the front wheel brakes merely by using the lever in the ordinary way, when the action would be direct by lever and rod. This firm also discovered, quite independently, through racing, the importance of dealing with the twisting strain on the axle; this year's 2-litre Sunbeam and Fiat Grand Prix racers are both distinctive in having tubular axles for lightness sake, whereas in the standard products the axles are built solid. This very important mechanical development will presently affect all motor users, because as the car is lightened and the efficiency of power plant increased the possible means of braking must be increased, because the lighter the vehicle the less the road adhesion per wheel, therefore the less the brake application possible. Anyone now considering the purchase of a car equipped with front wheel brakes should require a demonstration of the ability of the vehicle to negotiate a turn during application of the front wheel brakes. I write this because there is introduced at least one car with brakes to all four wheels in connexion with which the designer intends that they shall be used only when the car is running straight, and not at a corner or turn. This must be due to the method of control whereby to apply such brakes when making a turn would be to interfere with the steering and so cause skidding. But inasmuch as all car design should be governed by a knowledge of what is instinctive in nature it will be appreciated that any such braking system is impracticable, and can lead only to dangerous situations since, if a driver is provided with a lever the pulling of which he knows applies braking effort, and he finds he has approached a corner too fast and is dashing to disaster, it is certain that he will not let go that lever at the critical moment, but will instead pull it to the utmost, with dangerous consequence to himself, passengers, and other users of the highway.

SMALL SIX-CYLINDER SLEEVE VALVE ENGINES.

The two outstanding mechanical features of all new car design concern brakes and engine valves. Unquestionably the overhead valve is being increasingly used, though some manufacturers, including notably such new members of the American industry as use overhead valves, do so on principles that do not obtain that higher proportion of efficiency, as represented either by power or economy of fuel, which should be the sole reason for employing this gear; if properly done great saving of heat loss can be effected. But the overhead-valve engine has not by any means ousted the poppet side set type. Nor has it eliminated the sleeve type. In fact the last named has been developed notably this year, as witness the showing in the French long distance road race for the Grand Prix de Tourisme, wherein the cars were run on a fuel allowance, and loaded with the equivalent of four passengers, the running weight of each scaling approximately two tons, yet 65 miles an hour mean speed was achieved by the winner. All the cars in this race were equipped with double-sleeve valve engines having a mean effective pressure of 6.3 to 1, which is unprecedentedly high for standard car practice. These engines turned at a speed we should have thought quite impracticable for this type in the pre-war period. Minerva introduces some interesting smaller double-sleeve valve engined types, and all the novelties from the firm that pioneered the whole proposition, the Daimler Company, are in the direction of making this type more popular. Thus, the Daimler 21-h.p., 30-h.p., and 45-h.p. 6-cylinder models are now supplemented by a 12-h.p. 59 by 94 mm. (= 1,541), 70 c.cm., 6-cylinder double-sleeve valve engined chassis, as well as by a 16-h.p., 65.5 by 104 mm. (= 2,166), 74 c.cm. double-sleeve valve 6-cylinder engined chassis, to be sold at £550 and £625 respectively; it is sold also with four-seater bodies. Further, through its associated concern, the Birmingham Small Arms Company, this firm introduces a 4-cylinder double-sleeve valve, nominal 11-h.p. B.S.A. car, the bore measurement being 65.5 mm. and the piston travel 104 mm., and the chassis details being almost the same as those of the air-cooled B.S.A. model introduced as a two-seater last year.

There is also a 6-cylinder B.S.A. model of the same engine size as the 12-h.p. Daimler, but the chassis type is, of course, utterly different. Thus the Daimler B.S.A. programme of fifty-seven models now includes vehicles costing complete from £230 to £2,000, a matter of interest to members of the medical profession being the introduction of complete 6-cylinder small saloon and coupé Daimler types at popular prices, the smaller Daimler models being akin to the largest ones alike in quality and finish; also, in regard to the design, the only apparent constructional difference is the use of semi-elliptic rear springs. In regard to the B.S.A. cars standardized complete with coachwork, one of the cheapest is an interesting variant of the all-weather side panelling scheme. In this the panels slide longitudinally when it is desired to have access either to the front or to the back seats, or to provide ventilation to the vehicle by that means. The other still more novel item is on the all-weather type of body wherein, nevertheless, there are windows that rise and fall as though they were glass. They are, however, made of particularly hard celluloid, to the gain of clearness. Of course, by this means the weight of the window is practically negligible. Further, it is possible for the window as a whole to bend when it is raised or lowered, as it is necessary to accommodate the curved lines of the coachwork. Voisin, hitherto associated with the largest and most expensive types of car, also introduces an 8–10-h.p. double-sleeve valve engined small car with front wheel brakes. The 6–8-h.p. (travel rating 5-h.p.) Renault has a mixture controller

gear mounted on the steering column. The 4-cylinder water-cooled engine has 58 by 90 mm. bore and stroke; the gearbox three speeds forward; dynamotor electric light equipment is standard, and a transverse rear spring is used.

The Battle of the Valves.

Even Rolls-Royce is among those making smaller cars. This firm introduces a nominal 20-h.p. 6-cylinder machine with three-speed gearbox controlled centrally, and semi-elliptic springs fore and aft. But this type is not shown at Olympia, the firm regarding it as entirely supplementary to the large 6-cylinder side-valve engined type, which is represented at the exhibition by numerous examples. Nevertheless, the smaller machine is interesting as being the first-fruits of the firm's unique experience in aircraft engine construction during the war and bringing the make within the purse range of "Harley Street." Thus, as we have in the latest motor spirits marketed those that are mixtures of benzol with petrol and which are known as "fifty-fifty," so we have a number of the leading manufacturers in the motor world, including Rolls-Royce, Fiat, Vauxhall, and Wolseley, exploiting what may be called a "fifty-fifty"-valve policy. For instance, Fiat has a big overhead-valve 6 cylinder engined car this year, but the 4-cylinder types and the 20–30 h.p. 6-cylinder model have side valves. Vauxhall uses side valves for the nominal 14-h.p. type, and overhead-valve engines for the two larger chassis; and Wolseley uses side valves for its 6-cylinder, for its 14-h.p. 4-cylinder, and for its 2-cylinder 7-h.p. chassis; but overhead valves for its 10-h.p. and for its 15-h.p. 4-cylinder chassis. Again, among small car builders G.N. offers a chassis with an engine having side valves only, as distinct from overhead inlet and side exhaust valves, and another chassis having a 4-cylinder engine with overhead inlet and exhaust valves. Humber, as we have noted, has designed an engine with overhead inlet valves and side-by-side exhaust valves. Notable novelties introduced from the Continent chiefly range in the 2,000 c.cm. (122 cubic inches) engine volume, and in the 1,500 c.cm. (91½ cubic inches) cylinder content classes, as witness the Ansaldo 2,000 c.cm. 6-cylinder model; the Ballot 2,000 c.cm. touring model; and the Bugatti 2,000 c.cm. 8-cylinder model of entirely new design with, incidentally, sparking plugs approximately the size of cigarettes only. Nominal 10-h.p. types are introduced from the Continent by Hurtu, Léon Bollée, Lorraine-Dietrich, Salmson, Th. Schneider, and Vermorel. Perhaps the most interesting of all tendencies, however, to medical men is the before-mentioned re-entry of no less renowned a firm than Renault into the quite small car market.

A Radical Departure in Car Design.

Unquestionably no departure so radical, without freakishness, is produced as by Lancia on behalf of Italy in a 13.9-h.p., 4-cylinder, overhead-valve engined car with a frameless chassis. This notable development is achieved by the use of a steel pressing for the frame of the coachwork, which is all pressed in one piece, including the frame, for the radiator as well as the tube for enveloping the propeller shaft. The structure is therefore considered to be sufficiently strong to act as chassis frame as well as coachwork frame. It is a wonderful design, entirely practicable and resulting in a remarkably light vehicle, the channel section of stamping being used. Other notable features in this chassis are the overhead-valve engine on the principle that was introduced some time ago in a 12-cylinder model, and which is notable for the extraordinary brevity of the over-all length. In the case of the present 4-cylinder type the same system is used whereby the cylinders are staggered in a 20 degree V only, resulting in a crankshaft of extraordinary rigidity and shortness, the whole power plant giving the first impression that it must be a 2-cylinder type.

General Tendencies.

No one springing system is predominant; nor is any one ignition system, though it would appear that the coil ignition principle is gradually gaining ground. There are, however, notable developments in connexion with magnetos, particularly the new style B.L.I.C. introduced by Vickers, and concerning which Dr. Turner read a notable paper at the recent meeting of the British Association. This is an extraordinarily light, durable, and simple system of magneto. It is remarkable for the efficiency of the spark at engine speeds lower than those at which it is possible to achieve satisfactory carburation, and, at the other extreme, for efficient sparking at the high revolutions at which the most efficient modern engines work. Some manufacturers introduce steering wheels that are still larger in diameter, but of a smaller section, the claim being that steering is rendered easier. Of course, if steering gear is designed properly, there should be no call for this change, since we have been in the habit of using wheels almost excessively large for the convenience of the driver and of those seated next him. Properly designed cars should not require the driver to sit with arms akimbo. Nor should it be necessary for him to make exaggerated movements, as has to be done too often with the steering wheel to make a car deviate even slightly out of the straight path—as, for example, when encountering other vehicles on the road. Than that, no spectacle is more ordinary. It is merely a demonstration of badly designed steering. Further, the use of a smaller section wheel is not desirable on the grounds of comfort, as any one can appreciate who has to do half a day's or a day's driving at a spell. The size in general use hitherto has been the minimum if cramp from overcontraction of the fingers is to be avoided. Properly designed steering is so light nowadays as not to need the use of a wheel of large diameter. We want wider wind screens, not steering wheels.

A solution of the problem of using lower grade fuel with higher compression ratios, regarding the carbon formation process and eliminating "pinking," is furnished by the introduction of the Hobson "non-pinker" (licensed Ricardo and Dodson Bi-fuel Patents), an apparatus supplementary to the carburetter, but the control of which is coupled up with the carburetter control, so that the "non-pinker" is brought into operation at such openings of the throttle as would produce "pinking" conditions without its use. For this purpose it is used solely with water, so obtaining in current type engines run on low-grade fuel the same effects as are at present obtained only by the use of benzol, or of benzol mixed with petrol. In regard to the future of engine design, this development renders it possible to raise compression ratios from 4.6 : 1 (the present average standardized) to 6 : 1, which means opening a new chapter of possibilities in power plant design and production. But in such higher compression engines, of course, the "non-pinker" would not be used to run on water; instead, it would be run on alcohol, hence you would really have the true bi-fuel form of carburetter.

Examples of Lines of Development.

Auto-Carriers is one of the first firms to introduce a small 6-cylinder car. Its £16 tax side-valve engined 6 cylinder chassis with magneto or dynamo ignition at option, right hand gear and brake controls, worm drive and steel disc wheels, is listed, complete with electric engine starting and car lighting set, for £535, or, as a four-seater "Royal" model, at £700. The £12 tax 4-cylinder A.C., with 4 mm. bigger bore measurement, is listed, as a two-seater, at £475 complete with dickey. A notable price proposition among the new small machines is the £9 tax "Ariel Nine" with single shell family four-seater body and horizontally opposed, twin-cylinder, water-cooled engine, retailed at £235, with all weather side curtains opening and closing with the door, and disc wheels. This is, therefore, one of the examples in which a notable effort is made to overcome the problem of the dickey seat for small cars, in that in the new Ariel when the hood is raised the occupants of every seat are protected from the elements. The 10 h.p. Enfield-Allday two-seater is marketed at £445 and the four-seater at £450; the firm, which has made great progress during the last year, has introduced a new 12-h.p. 4-cylinder model with an engine of 1,757.33 c.cm. volume, three bearing crankshafts, and forced feed lubrication, together with a gearbox giving four speeds forward, the control being by the driver's right hand. The rear axle is spiral bevel driven, and the rear springing is a version of the cantilever principle. The 1923 £11 tax Galloway car is rated at 10–20-h.p. by the makers, the engine size being somewhat increased (66.5 mm. bore by 110 mm. piston travel). Spring box clamps are employed in connexion with the suspension system; the tools are housed in a drawer under the running board. The side curtains are accommodated in the rear of the driving seat when not in use; they are quickly detachable and have ample opaque areas, so that when the vehicle is used as a completely closed four-seater type there is good natural illumination for its occupants. The Galloway two-seater car, shown with open body and adjustable driver's seat and dickey, is painted light brown and suitably upholstered, being listed at £295 complete, and the four-seater, with three doors, at £350, in both instances delivered at the works.

New Ideas in Body Schemes.

To meet a demand for a Calcott car of slightly heavier proportions an entirely new 13.9-h.p. 4-cylinder model with an engine volume of 2120.57 c.cm. has been introduced with an enclosed oiling system giving the power plant a neat appearance. The gearbox has four speeds forward, and the gate change is accommodated on the driver's right so that there is no question of interfering with the convenience of the occupants in the front seat. Both foot and hand operated brakes act direct, side by side, on drums attached to the rear

wheels. The final drive is by spiral bevel gear. The particular shade of blue adopted by the firm as standard this year is of a distinctive and attractive hue. This 13.9-h.p. coupé is listed at £425. The 10.5-h.p. 4-cylinder Calcott model is marketed as a two-seater with double dickey, double windscreen and side curtains, together with 12-volt electrical engine starting and car lighting set, for £325. A new design of convertible coachwork and certain chassis refinements are features of the Hillman programme for the coming season. Note should be made of the very clever manner in which the windows have been made particularly wide, including those furnished to the types with collapsible hoods; the easy adjustments for reach provided by simple and rapidly operated mechanism in connexion with the seats, the maximum range being no less than 13 inches; the carrying of the side windows when out of use in a special compartment provided behind the seat, and especially the ingenious method whereby the side screens can be so set when the top is furled that they serve as an excellent means of protecting the rear passengers, in the style of a V-shaped wind screen. By means of a distance piece the side screen can be set slightly open, a point which will be much appreciated in many circumstances of driving. Another novelty is the furnishing of a locker on the front side of the dash to serve for a tool kit. In regard to the engine, the three-bearing crankshaft is now balanced rotationally and statically, as are the flywheel, the clutch, and the clutch shaft. By reason of the improvements in detail the Hillman engine develops more power; the exhaust box has been increased in size, and larger gears with helical teeth are used in connexion with the timing details.

Protecting All Passengers Adequately.

Apart from notable reductions in price, perhaps the outstanding feature of the Rover programme is the introduction of the single shell type four-seater body on one of the 8-h.p. models listed complete for £190, thereby setting an entirely new standard of cost, for the hood completely encloses the occupants of all seats when in service. There have been improvements, likewise, in regard to the 12-h.p. Rover car, the engine of which now has pressure-fed lubrication. The 12-h.p. two-seater has been reduced £100 in price to £525, and the 12-h.p. four-seater a similar amount to £555; the coupé body with fixed top is now listed £100 cheaper at £650, and with drop-head type top £125 cheaper at £675. Again, the 8-h.p. two-seater, including all-weather side curtain opening with the door, is reduced no less than £40 to £180. Moreover, last year's price did not include side curtains. The Standard Company has given notable attention to the question of ample interior light in its new models; two new 13.9-h.p. Standard saloon types are introduced: one has smart square coachwork lines, an exceptionally natural interior lighting scheme, together with unusually long leg room and complete fittings, including adjustable seats in front. In the Standard special saloon a transverse spare wheel carrier is furnished at the rear. The 8-h.p. model, which was introduced last year, is in a somewhat different form, and is shown both as a chassis and as a two-seater with dickey. But stand space does not permit the display of this type as a four-seater, which is to be regretted, for it accommodates four persons without excessive overhang at the rear. These small cars, like the larger Standard models, are fitted with all-weather side panels in connexion with a collapsible hood—a principle pioneered by the firm and now becoming universal. The 8-h.p. car has now an electrical engine starter in place of hand-operated equipment, and magneto ignition instead of the battery system first employed. The reductions in the whole range of this firm's car prices are great. The 4-cylinder Waverley types are rated respectively at 11 and 15 h.p., the standard 11-h.p. two-seater being listed at £325 and the model *de luxe* four-seater at £450; while the 15-h.p. model *de luxe* five-seater costs £595, and the four-seater coupé with three doors £750. The touring types are fitted with all-weather curtains. In the 9.5-h.p. 4-cylinder 1,087 c.cm. £10 tax Rhode we have a four-seater car listed complete at £250, or, with self-starter, £15 extra; or as a coupé at £325, with overhead valve gear, detachable cylinder head, Cox carburetter, Brolt electrical engine starter, and magneto ignition, together with thermo-siphon cooling, a gearbox giving three speeds forward, and spiral bevel final drive. The suspension is by quarter elliptic springs fore and aft. Detachable disc wheels are standard, the vehicle having a road clearance of 8 in., an over-all length of 11 ft., a shellbox of 8 ft. 6 in., and a track of 3 ft. 10½ in.

Accessories.

In regard to exhibits by coachmakers, one notes that Offord and Sons display three types of all-weather, all-purpose cars, each of moderate power, the 12.8-h.p. 4-cylinder Austin all-purpose carriage having a featherweight Offord body to seat five; the scheme is designed specially to meet the requirements of medical practitioners. The wide seat for three persons in front gives ample leg room for a tall driver. The hood is of special design and is supplemented with side curtains that open and close with the doors. There is a spare wheel and side curtain lockers under the seat. There are doors on both sides for the convenience of the driver, the colour scheme being blue-grey picked out in black and upholstered in dark blue-grey antique leather at £565 complete. The 15.9-h.p. 4-cylinder Humber is an all-weather car which also accommodates five persons and has special convenience of entry by reason of an ingenious scheme of staggered doors, and sliding armchairs to the front. Special elbow rests are provided for the rear seats when occupied by two persons only. The 18.2-h.p. 4-cylinder Buick has also a featherweight, all-weather Offord body; but the accommodation in this case is for four, the price being £595 complete.

Reference was made in these columns a fortnight ago to the extraordinary change that has come over tyre construction and costs. Therefore it will suffice here to note that the Dunlop exhibit affords convenient opportunity for examining the entirely different construction now standardized on the cord principle with beaded edges and non-slipping all-rubber treads that is, perhaps, the outstanding feature of current tyre development as applied to standard motor cars. The prices, covers with tubes included, are less than the pre-war cost, though many of these pneumatics will give 18,000 miles service against an average of about 4,000 miles before the war. To obviate the aggravating defect, often manifest in the past, of the walls of an outer cover bursting before the tread shows signs of approaching the end of its useful life, the Beldam Tyre Company shows the special design of rubber treads to prevent this trouble; these have a number of side projections which act as buttresses, with the result that a thick tread can be provided to make contact with the road without the walls flexing along a definite line of the fabric and causing localized stress and wear. Apart from the well-known Duco spring gaiters, Brown Brothers exhibit a range of Duco dipping headlights, actuated by means of Bowden cable and lever control, the fittings being arranged to drop on the prongs of existing brackets. The display of the full range of the latest Zenith carburetter designs is supplemented by a special set of carburetters with adaptation, or inlet pipes, enabling them to be fitted easily to a number of popular motor cars. Among the comprehensive array of articles displayed by Gamage are the latest fashions in motor clothing for the winter months, including the slip-on, roomy, waterproof umbrella coat fitted with rubber neck. One of the useful exhibits on this stand is the simple foot-warmer, which shows certain practical improvements on its prototype marketed before the war.

In conclusion, while I have made every effort to be accurate in the foregoing account of novel features at the show, nevertheless it is necessary to put on record the fact that I have never known, in the course of the whole series, such difficulty in arriving at the facts. There have been choppings and changings of policy up to the last moment. Therefore I should be obliged if any manufacturers concerned would draw attention to any details in this account which do not correspond absolutely with their programmes as decided on finally for the forthcoming season, to the end that the facts concerning the finally approved schemes may be mentioned next week.

An outbreak of 51 cases of poliomyelitis in children, with 5 deaths, and 2 fatal cases in adults, has occurred at Tübingen. The fatal cases all showed signs of Landry's paralysis. Twenty-seven cases of poliomyelitis have recently occurred at Marburg, and all the schools have been closed.

According to the census of 1921 the population of France has fallen since 1911 from 39,604,892 to 37,499,917, while the number of foreigners has increased by 417,763, so that there are about 2½ million French inhabitants less than in 1911. Only eight of the ninety departments have shown an increase of population.

Official statistics show that the mortality has been higher and the birth rate lower in the forty-six large towns of Germany during the first half of this year than in the corresponding period of 1921. The mortality from tuberculosis is somewhat higher, while that from infectious diseases in children is lower.

The late Mr. John Graham, farmer, of Methven, Perthshire, who died in June last, leaving personal estate valued for probate at £131,724, has bequeathed, subject to numerous bequests, the residue of his estate, which is expected to amount to about £60,000, to the Perth County and City Royal Infirmary.

British Medical Journal.

SATURDAY, NOVEMBER 4TH, 1922.

INSULIN AND DIABETES.

Readers of Professor J. J. R. Macleod's summary (published at page 833) of the work carried out during the past two years in the Toronto Medical School, on the specific treatment of diabetes mellitus, cannot fail to draw the conclusion that a scientific advance of immense importance has already been accomplished.* Earlier attempts at extraction from the pancreas of a hormone controlling carbohydrate metabolism had produced results too capricious and indefinite to carry conviction; and the attribution to the gland of this endocrine function was based almost entirely on the effects of extirpation and grafting. The more definite assumption, that the islets of Langerhans were responsible for producing the hypothetical hormone, was similarly based on histological examination of the pancreas under various conditions.

The Toronto observations, which were initiated by the brilliant enterprise and fresh enthusiasm of F. G. Banting and C. H. Best, and have now, with the advice and co-operation of Professor Macleod himself, been extended over a wide range by a team of collaborators, have placed beyond all doubt the existence of the pancreatic hormone, its origin from the Langerhans islets, the possibility of extracting and separating it in active and relatively stable condition even from the normal adult mammalian pancreas, and its efficacy in correcting the metabolic defect which causes diabetes mellitus. Only the mere outskirts have yet been surveyed of the rich new physiological territory which now lies open to exploration.

To the practising physician a matter of even greater interest will be the promise of a really great advance in the treatment of human diabetes and the substantial success in this direction which is, indeed, already on record. Whole-hearted enthusiasm for this splendid achievement does not conflict with but rather demands a wise caution against a too hasty assumption that the practical therapeutic problems have been completely solved. Caution of this kind is clearly implicit in Professor Macleod's guarded statement.

The methods of producing active solutions of "insulin," and of gauging their activity, would appear to call for much further investigation before any institution, scientific or commercial, could safely promise regular supplies of a satisfactory and uniform preparation. Any wide extension of the treatment before such regular supplies can be guaranteed would involve real cruelty and possible danger to the sufferers, and impair the credit of the discovery with the public. No definite expectation is yet warranted that a case of diabetes can be cured by insulin, so as to be placed beyond the need for its further use. The indications point rather to the probability that regular administration, continued in most cases throughout life, will be needed to maintain improvement. In this direction the treatment may be compared with that of myxoedema by thyroid gland. There is the additional complication in the case of the insulin treatment that hypodermic injection is as yet the only method of proved efficacy. Experimental and clinical evidence combine to indicate the danger of overdosage, a too rapid or severe fall of the blood sugar having as a result distressing symptoms which may be dangerous or even fatal if unchecked.

Under all these conditions it seems clear that the treatment has not yet reached a stage at which it can be made available to the profession for general application. Under expert supervision, in clinics where diet and dosage can be accurately adjusted and effects controlled by regular, skilled analysis, results of high promise have been obtained in Canada and the United States, and will no doubt be obtained in this country when supplies of insulin are available on a sufficient scale. Only careful study under such conditions, and the improvements which are practically certain to be made in technique and control, can make this new knowledge applicable to the treatment of sufferers from diabetes in general.

It is imperative, moreover, that any such extension of the treatment beyond organized experimental clinics shall be made under conditions giving the strictest scientific control of the preparation supplied to the profession. The authorities of the University of Toronto, realizing this necessity, have taken steps to protect the process of manufacture, and we are glad to note that they have offered to place this means of control, for this country, in the hands of the Medical Research Council. We understand that a deputation sent by the Council to study the position of this treatment on the American continent has now returned to this country. We may venture to express the hope that the Council will find it possible to accept the offer made by the University of Toronto, and will take early measures to ensure the introduction of this most hopeful treatment into this country under such conditions of control as will serve the best interests of medical science and of the public.

*Notes of the preliminary reports made by Professor Macleod, Dr. F. G. Banting, Mr. C. H. Best, and their collaborators, were published in our columns of July 22nd, 1922, p. 140, and September 9th, p. 480.

AESCULAPIUS.

Several recent English publications have combined to draw the attention of medical men of this country to the deity of healing, after whom they and their profession are not infrequently called, and whose insignia appear on a large number of medical emblems.[1] Dr. Farnell, Rector of Exeter College, Oxford, in a learned work, with which medical historians will not always be in full agreement, has recently marshalled most of the inscriptional, artistic, and literary sources for our knowledge of the god in the earlier stages of his development. The position and reputation of the author demand great respect for his conclusions, though we regret that at times he does not himself exhibit a somewhat more tolerant spirit towards the views of certain very eminent scholars. The Aesculapian cult extends over so wide an extent of time and place, its origin is so obscure, its developments so various, the records so broken and partial and often apparently so contradictory, that there is room for much difference of opinion, though certain conclusions are now fairly sure.

Dr. Farnell's most important deductions may be considered under two headings: first, the original identity of the god with an actual man, and secondly, the relation of his cult to the subsequent development of medicine. Much cogent evidence may be adduced for regarding Aesculapius as an historic personage. In the well-known Homeric catalogue of ships he is spoken of as the father of the completely human physicians, Podaleirius and Machaon, and associated with Trikka in Thessaly. There is certainly much in the subsequent

[1] L. R. Farnell, *Greek Hero Cults and Ideas of Immortality*. The Gifford Lectures, delivered in the University of St. Andrews in the year 1920. Oxford: Clarendon Press, 1921. E. T. Withington, "Asclepiadae and Priests of Aesculapius," *Studies in the History and Method of Science* (C. Singer), vol. i, Oxford, Clarendon Press, 1917. M. N. Tod, "Recently Discovered Records of Ancient Cures," *Proc. Roy. Soc. Med.* (Hist. Sect.), vol. xv, p. 22, 1922. Charles Singer, *Greek Biology and Greek Medicine*, Oxford, Clarendon Press, 1922. J. Six, "Asklepios by Bryaxis," *Journal of Hellenic Studies*, vol. xlii, Part I, 1922.

history of his cult which is quite consistent with this. His history and that of his cult is indeed surprisingly like that of the Egyptian physician-god Imhotep, whom we know to have been an historic personage. Dr. Farnell is very convincing on this parallel, and he is evidently disposed to regard Aesculapius as of human origin, though he expresses himself with caution. On this view we may suppose that the original Aesculapius was a real practitioner of medicine who exercised his art in Thessaly somewhere about the year 1000 B.C. It is in considering the relation of the later Aesculapian worship to the development of medical science that much more debatable issues are raised.

The cult of the physician Aesculapius as a god which thus arose in the first instance at Trikka appears to have been associated with the serpent from a very early date. The great historic centre of the cult, Epidaurus in the Argolic peninsula, was secondary to that in Thessaly. It was, however, chiefly from Epidaurus that the worship of Aesculapius seems to have spread throughout the ancient world, and among the most interesting of its later centres were those of Cos, Athens, Pergamon, Alexandria, and Rome. At Epidaurus the extensive ruins were long ago excavated by the now venerable Professor Cavvadias, whose son, at the recent Congress of the History of Medicine in London, gave a review of the relation, or rather the want of relation, of the medical profession to the Aesculapian worship in antiquity. At Cos similar excavations by the Germans described by Dr. Herzog have been less productive. Concerning the migration of the god to Rome, Livy and Ovid give circumstantial accounts of how the sibylline books during the plague of 293 B.C. induced the State to send an embassy to Epidaurus to seek help from Aesculapius. The ship returned, under the god's favour, bearing the sacred serpents, and stopped at an island in the Tiber where the animals chose to land. A temple arose there, and the sanatorium in connexion with it became famous in imperial times. Traces of the temple can still be seen on the island of St. Bartolommeo, part of the rock of which is carved into the form of a ship's poop decorated with a serpent twined around a staff.

The problem concerning the Aesculapian cult that must especially interest our profession is whether and how far, if at all, the worship of the god was associated with the development of scientific medicine. The worship of Aesculapius reached in later times a high degree of spirituality. Locally, and under special conditions, he even ultimately attained the rank of a supreme and perhaps universal god whose cult bore certain obvious parallels to that of Christianity. Speaking generally, however, his worship was on a low plane of folk belief and associated with a great amount of priestly deception, some of which was certainly wilful. We know from several writers that the practices of the Aesculapian priesthood were a subject of derision among the better educated and more level-headed of the ancients. So far as we are able to see, there is no trace either in its higher or lower development of any of the elements out of which science could be built. Furthermore, though many medical men, including Hippocrates himself, are spoken of by ancient writers as "Asclepiads," there is no evidence in the whole of the literature of medical antiquity of the association of a medical man of scientific repute with the worship of the god. Moreover, we do not know what the term "Asclepiad" really implies, for, though we assume it to involve membership of a physicians' guild, we can but guess at the nature and claims of membership of a company of which we know absolutely nothing. It seems more than probable, however, that an Asclepiad was not in any sense a *priest* of Aesculapius. It is true that instances can be adduced of professional physicians, otherwise almost unknown, who were actually priests of Aesculapius, and that some medical men were accustomed to sacrifice to the god. But this is no ground for asserting that medicine grew out of Aesculapian worship.

That there is a field in which science and religion may be and are of use one to the other all medical men will most readily admit. It is yet a patent fact of history—a fact which Dr. Farnell himself sufficiently emphasizes—that, on the whole, the great religions have been inimical to the free prosecution of scientific inquiry. The folly and wilful deception of the worship of Aesculapius, as its record has reached us, can have been no more helpful to scientific research than any other religious system known to us. Where the Greeks, however, differed from many other peoples is that their priesthood was comparatively weak and divided against itself by the number and variety of their cults, and that their opinions were not reinforced by the study of sacred and canonical books. This gave the philosopher and man of science a freedom of thought and expression which he never experienced again until modern times. That freedom largely explains the success and enthusiasm with which science was prosecuted in remote antiquity. The authors of such Hippocratic works as *The Sacred Disease*, the *Airs, Waters, and Places*, or *Epidemics I and III*, all of which were probably composed in the fifth or early fourth century B.C., were as far removed from the practice of the priesthood of Aesculapius at Epidaurus and elsewhere as are the researches of a great modern physiological laboratory from the practice of Lourdes. Certainly the case for the relation of Aesculapian worship to scientific medicine is no stronger than that which could be and has been made out for modern medicine as a product of Christian thought by pointing out that Nicholas Stensen, whose name is associated with the salivary duct, became a bishop and that several distinguished churchmen, including one pope, have held medical degrees.

Professor Cavvadias junior, in his recent address at the International Congress of the History of Medicine, following his father, who is in agreement with Dr. Withington and the majority of modern medical historians, traced the development of the priestly medicine and the physician's medicine of antiquity along quite separate lines which seldom or never meet. That they may have had a common origin in the natural wonder of man, who always seeks somehow to explain the world in which he lives and to better his lot, all will admit. Few medical men, we think, who take the trouble to peruse the Hippocratic collection and then glance at Dr. Farnell's evidence of the nature and history of Aesculapian worship will be likely to believe in any closer link. But whatever their origin and finer relations no one, surely, will doubt that the main course of ancient scientific medicine was manifestly separate from that of the worship of the god of healing. It is the spirit of Hippocrates and Aristotle, and not that of Aesculapius and Chiron the Centaur, that rules the medicine of our time.

THE INSTITUTION OF THE LEEUWENHOEK VEREENIGING.

The members of the Dutch Cancer Institute held a very successful international conference from October 23rd to 25th at Amsterdam. In the laboratories of the Antoni van Leeuwenhoekhuis, under the presidency of Professor J. Rotgaus, there gathered together a dozen prominent experimenters from England, France, Germany, Austria, Denmark, and Switzerland to discuss the most recent advances made in the experimental study of cancer, and the Dutch are to be congratulated on bringing to the same table men of such different nationalities. The various communications, dealing with the methods of producing cancers, the latent period in the reaction to an irritant, and the analyses of the early and precancerous

changes, will be published in a special commemorative volume, and some will soon appear in our pages. The impetus which these meetings give to experimental cancer research, the interchange of ideas and criticism, and the cordial relations established between the various workers, mark a milestone in scientific endeavour. Future meetings will be held in neutral countries at such times as seem necessary according as researches accumulate. Owing to the charming hospitality of the Dutch, no less than to the excellent scientific contributions, the first meeting will always be memorable. The various representatives agreed to form a society, without definite rules or constitution, which would act as an exchange for original work. Long discussions ensued about the name of the society, till one of the members, a Scotsman who claimed to be a "foreign Dutchman," suggested the title of "Leeuwenhoek Vereeniging," out of compliment to the memory of the illustrious Dutch scientist. We wish it all success.

THE REGULATIONS OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON.

The Royal College of Physicians of London has recently made certain alterations in its by-laws and regulations which are of special interest to Members and to candidates for that diploma; one change is of interest to Fellows also. The changes have been duly reported in our columns on October 28th (p. 828) and in this issue (at p. 894); but it seems desirable to attempt to indicate how they will operate. The chief effect of one of the alterations will be to permit a Member to practise in partnership and to buy or sell the goodwill of a practice; he will also be allowed to dispense his own medicines or to make arrangements with a pharmacist to do so. For years past instances have frequently occurred in which a Member has found it desirable to enter into partnership, and it has then always been necessary for him to resign his Membership. Later on he might apply for this to be restored, and it has been the practice of the College to accede to his request unless there was some very good reason to the contrary. In future a Member entering into partnership, dispensing his own medicine, or making arrangements with a pharmacist to do so for him will be able to retain his Membership. These restrictions continue to apply to Fellows. A consequential alteration is that a by-law prohibiting admission to the examination for Membership of a candidate who practised in partnership, or dispensed medicine, or made arrangements with a pharmacist to do so has been repealed. This by-law also forbade a Member of the College to be engaged in trade; the exact significance of this is not apparent. Another change has reference to the association of a Fellow or Member of the College with a company or institution having for its object the treatment of disease for profit. In 1888 the College passed a resolution declaring "that it is undesirable that any Fellow or Member of the College should be officially connected with any company having for its object the treatment of disease for profit." The interpretation of this resolution sometimes gave rise to difficulties; the College has now defined its position by adopting the following resolution: "That, subject to the provisions of By-law CXC, it is undesirable that any Fellow or Member of the College should have any financial interest (whether direct or indirect) in any company or institution having for its object the treatment of disease for profit, other than the receipt by him from such company or institution of (1) a fixed salary, or (2) fees, for such services as he may render to such company or institution in his capacity of medical practitioner." By-law CXC, it may be explained, states the powers of the College with regard to Fellows, Members, or Licentiates who have been guilty of any great crime or public immorality, or acted in any respect in a dishonourable or unprofessional manner, or violated any regulations of the College. If the charge be of sufficient importance, and is established, the College has power to withdraw the diploma of the Fellow or Member or Licentiate for a limited period of time, or altogether, as may be determined. It has also power in minor cases to admonish or reprimand a Fellow or Member or Licentiate, or to inflict a fine not exceeding £10. The College has not arrived, we understand, at the resolution above quoted without long consideration. It was felt on the one hand that it would be most undesirable to interfere with the kind of practice which is now commonly called team work, but on the other that the College could not countenance arrangements under which a medical man had a personal financial interest in the success of an institution of the kind mentioned, since circumstances might arise in which such interests might come into at any rate apparent conflict with his duty as a medical practitioner. Another difficulty the College may experience when interpreting its resolution is with regard to the manner in which such institutions are conducted and advertised. Of this difficulty the British Medical Association has had much experience, in relation particularly to so-called "medical aid institutes." It was found that such institutes were often conducted by their managing committees in such a way as to exploit the medical officers—paying them very insufficient salaries, subjecting them to irritating supervision, and using their names for advertisement. The Association steadily set its face against such exploitation, and after a long and fluctuating fight succeeded in scotching, if it did not completely destroy, the evil. It will be necessary for the College to keep a very close eye on the methods of institutes seeking a richer *clientèle*, in order that any improper tendencies may be nipped in the bud.

ECONOMY AND DISEASE.

We print elsewhere an abstract of a paper by Dr. R. J. Ewart on the economic factor of the decline of tuberculosis and a report of the discussion which followed. The subject is of immediate interest, and those who have discussed it in the lay press might be likened to the duellists in *Mr. Midshipman Easy*. At one apex of the triangle is the socialist doctrinaire who will eradicate disease by the instrumentality of a whole-time State medical service, free meals for all, and houses at an uneconomic rent; at another apex gesticulates the "anti-waste" orator, who asserts that if the "public" is only left alone, and does not have to feed and clothe "bureaucrats," it will grow fat and healthy; at the third apex is the more or less gloomy popular eugenist who favours leaving things to "Nature," but differs from the "anti-waste" exponent in desiring to endow "fit" parenthood. Naturally all those who debated the subject at the Royal Society of Medicine were *within* the triangle and a long way from any apex of it, for it is plain enough that there is no standing room for an intelligent man on a Euclidean point. Probably the medical man who has turned over the pages of Simon's reports and paid attention to the actual manners and customs of working-class patients now and twenty years ago, will think that Dr. McVail went closest to the root of the matter. The connexion between polluted water supplies and typhoid is obvious now to the densest local authority, and the most parsimonious does not contend that to spend money on pure water is wasteful; certainly not all communities using diluted sewage as a beverage sixty years ago did so because they could not afford anything better. The village of Terling was very poor, which might explain what happened there, but plenty of funds were available for, say, Windsor Castle. The authorities of Windsor Castle and of Terling had the common factor of ignorance; the great sanitarians of the mid-Victorian period had to dispel that ignorance; to do so was a heavy task, but the task was achieved. The men must indeed have a touching faith in the natural good sense of our fathers who supposes that if the money which went in the salaries of Simon, Buchanan, Thorne Thorne, and their fellows had remained in the pockets of the taxpayers, the position with respect to water-borne disease in England would be what it is to-day. Yet it might have been quite easy for a statistician of the late seventies to construct a diagram showing a parallelism between the decline of typhoid and the increase of commercial prosperity in the palmy days of "free trade." Our problems to-day are different in detail but perhaps not in

essence. There are still a few facts respecting health which the man in the street and his local or national representatives do not know; a knowledge of these facts can only be disseminated by a public health service. A wise man will stand within the triangle a long way from the doctrinaire's apex, but not very close to that of the "anti-waste" orator.

THE NATURE OF FILTER-PASSING VIRUSES.

Wide interest has been aroused in that group of organisms known as ultramicroscopic viruses, or filter-passing organisms, by recent studies in connexion with influenza and by the remarkable phenomenon of bacteriolysis described by Twort and d'Herelle.[1] The considerable list of diseases described in the closing pages of every textbook of infectious disease as of "unknown etiology" is rapidly becoming depleted, the names being transferred to the apparently more creditable position under the heading of diseases due to filter-passing organisms. Influenza and the common cold were the last to make the move; powerful reasons for this transfer were brought forward by Dr. Mervyn Gordon at the Microbiology Section of the Annual Meeting of the British Medical Association, and it should be noted that the ranks of the filter-passing group are thus being swelled by recruits from diseases of bacterial origin also. What then is the nature of the filter-passing or ultramicroscopic viruses? Dr. H. M. Woodcock has made a contribution to the discussion of this problem,[2] in which he considers the evidence derived from the morphological appearances of these granules when stained by Giemsa's stain. He observes that everything which stains red with Giemsa does not necessarily consist of chromatin, and states that very similar appearances to those seen in smears said to show the filter-passing virus of influenza may result from the degeneration of the nuclei of epithelial cells and leucocytes; his arguments are illustrated by pictures of disintegrating nuclei. He claims to have shown by careful staining that the ultramicroscopic particles do not contain chromatin, for which reason they cannot be regarded as living organisms; and he looks upon them as products of the digestion of organized material. Although Dr. Woodcock does not consider these various bodies and granules to be the actual virus, he thinks a pathological enzyme may be adsorbed on to the granules so that though these granules are not the actual virus they may indicate its presence. In such a disease as influenza an auto-cytolytic action may be set in train, similar to the progressive autolysis observed in the Twort-d'Herelle phenomena, and this auto-cytolytic process may be transmissible through series of animals. It must, however, be said in justice to those who hold that the minute granules are living parasites that their opinion is based on other foundations than those provided by morphological appearances alone. No filter-passing enthusiast would claim that every granule was a living parasite; other origins of these granules are well known, though perhaps insufficient attention has been paid to the derivation to which Dr. Woodcock refers. Therefore, whilst our knowledge of the origin of some of the granules seen in Giemsa-stained films has been made more definite by Dr. Woodcock's work, it cannot be said that he has seriously shaken the contentions of those who look on influenza as being caused by an ultramicroscopic virus.

MEDICAL MEASURES FOR PREVENTING VENEREAL DISEASE.

The committee appointed last April, at the suggestion of Lord Dawson, and with the encouragement and support of the Minister of Health (Sir Alfred Mond), "to consider and report upon the best medical measures for preventing venereal disease in the civil community, having regard to administrative practicability, including cost," is now, we understand, sitting once a week, and has issued a questionnaire to prospective witnesses. It will be remembered that Lord Dawson's proposal was embodied in two questions. The first was, What, in the present state of knowledge, are the most efficient medical measures for preventing venereal disease? and the second, How far is it ethically justifiable to apply such measures? Lord Dawson suggested that those who had the technical knowledge should get together in conference and try to arrive at conclusions on the medical and administrative aspects of the problem, uninfluenced by any ethical considerations. Until such conclusions, supported by a considerable preponderance of opinion, had been reached it could not, he argued, be reasonably expected that the Ministry of Health should do otherwise than maintain impartiality. When the conclusions were formulated a wider public would decide whether it was ethically justifiable to found a policy upon them. A committee of selection, consisting of eight distinguished members of the medical profession, was appointed, and chose a Committee of Inquiry consisting of fourteen medical men and one medical woman. The names were given in the letter from Lord Dawson published in our issue of April 22nd (p. 655). Afterwards the name of Dr. Morna Rawlins, assistant to the obstetric surgeons in the Department for Venereal Diseases, Guy's Hospital, was added. Lord Trevethin, who had then recently retired from the office of Lord Chief Justice of England, consented to become chairman, and Mr. T. J. Tomlin, K.C., one of the standing counsel to the Royal College of Physicians of London, vice-chairman. The set of questions the committee has issued to the witnesses it proposes to hear are arranged under three headings: the first heading is as to the nature and efficacy of direct medical measures for preventing venereal infection; the second is as to the treatment and instruction of infected persons as an indirect measure for preventing venereal infection; and the third is as to the administrative measures that can and should be taken for preventing infection. Under the last heading the witness is asked to give an opinion on the efficiency and practicability of instituting measures of immediate self-disinfection, where this should be given, the form it should take, and at what age in both sexes it should be given. An expression of opinion is also asked as to the advisability of continuing the present system of free treatment at public clinics, and as to the propriety of instituting compulsory notification of venereal disease.

THE PLACE OF THE WHITE MAN IN THE TROPICS.

The question whether the white man can colonize and live permanently in the tropics has often been raised, and much argument has been adduced on both sides. A suitable climate, of course, means one in which he is able not only to live permanently himself, but to beget offspring who will go on living there and who will in turn raise up healthy and vigorous future generations there. Strictly applied, then, in this manner the answer is, No. A strong argument in support of this is the generally accepted belief that the aboriginal inhabitants of the hotter parts of the earth were black and of the colder parts white. Dr. Hewetson, in a very interesting paper read before the Rhodesia Scientific Association at Salisbury last May, surveyed the situation again from the medical and scientific aspects. Amongst medical points he mentioned that miscarriage is more common in white women in the tropics than amongst the blacks and the general birth rate is lower. He agreed with the statement made above, and indeed put it in much the same way. Suitability for living in the tropics, he said, means "the capacity to live in a country and propagate a stock through several generations, as good at least as that from which we sprang." Mere replenishment is not enough. Wherein exactly, he asked, lies the difficulty of Europeans colonizing the tropics? Is it due to germ diseases alone or is the cause climatic, or are both causes operative? There is no doubt that disease does play a part in limiting the activity and life of the white man in the tropics, but there is in addition all those conditions which may be summed up in the word "climate." Dr. Hewetson discussed many of the

[1] British Medical Journal, August 19th, 1922, p. 289 et seq.
[2] *Journal of the Royal Army Medical Corps*, October, 1922.

details embraced in this term. After referring to the influence of the actinic rays on the blood and on the nerves, he denounced in good set terms the dangerous effects of using galvanized iron for roofs and walls, for by them were produced abnormally high temperatures, which caused general weakness, cardiac distress, and paved the way for definite diseases. In addition to these physical effects there are the psychological, which are of the utmost importance: the neurasthenia, the monotony of always seeing the sun, the constant desire for stimulants "to buck one up," the cocktail before dinner to give one an appetite, and so on indefinitely. All the circumstances combine to produce neurasthenia. Dr. Hewetson suggests remedies to meet some of these evils, which seem well calculated to improve the condition and reduce the troubles. He suggests, for example, an absolutely non-heat-conducting roof of asbestos; this, however, would be expensive, and the ordinary thatched roof which the native (taught, no doubt, by long experience) uses for his huts might serve as well. The main factor still remains—the excessive heat—and it is this the white person cannot contend against in the long run. We grumble at the climate of England, but it is the constant changes of weather with the four seasons that harden one and produce the race best suited to inhabit these parts. That is why there are white people here; the excessive heat and constant sun, on the contrary, is why deeply pigmented people inhabit the tropics. We cannot get past this by any argument, however much we would like to do so, as has happened in the Northern Territories of Australia.

OPHTHALMIC PROGRESS IN EGYPT.

THE ninth annual report of the director of ophthalmic work in Egypt, Mr. A. F. MacCallan, shows that there has been further progress in the provision of ophthalmic treatment. The director calls attention to a distinctive feature of the Egyptian ophthalmic hospitals, in that twenty hospitals are grouped under one direction, in which 113,000 new patients were treated, 65,000 operations performed, and over one million out-patient attendances made during last year. He states that this faciiitates the systematic trial of various methods of operation and treatment. During last year, of the patients applying for treatment, over 15,000, or 12 per cent. of the total patients, were blind in one or both eyes. Attention is drawn to the distinction between the acute ophthalmias and the chronic disease trachoma. The acute inflammations may, in the absence of treatment, cause blindness in a few days, so severe are they. Chronic trachoma affects some 95 per cent. of the population; it very frequently causes depreciation of vision but less often blindness. Investigations have been made into the causes of optic atrophy. Last year 114 cases were seen, of which the majority were of the post-neuritic type; most of these followed acute infectious disease, generally typhus, but for the most part it was impossible to determine the cause of the primary atrophy. Investigations into the incidence of glaucoma show that it is more prevalent in Egypt than in other countries, the incidence amongst all patients being 1.77 per cent. as against 1 per cent. amongst Americans. From this disease there arises a serious tale of blindness owing to the late stage at which patients come for treatment. The following regulations have been laid down for the admission of candidates for posts in the Government service: The candidate must have a vision of 6/12 in each eye, or 6/6 in the better and 6/18 in the worse, the error of refraction not to exceed 6 diopters in each eye. If the glasses are stronger the candidate will be rejected unless his physical condition, apart from visual acuity, is above the average.

THE MOTOR SHOW.

THE Motor Show this year, which opened on Friday (the private view was on Thursday), is bigger than ever. Though some firms have not been able to engage enough space to display all the cars they wished to submit to the judgement of buyers, the number exhibited is so large that the visitor who has only a few hours at his disposal may well feel bewildered. The article on the Show published this week (p. 877) contains details in abundance to enable intending buyers to narrow down within reasonable limits the list of cars they would wish to see as most likely to meet their requirements in respect of construction and price. In addition an attempt is made to estimate the general trend of opinion and new enterprise in the trade. It is satisfactory to be able to draw the conclusion that the trend is towards reduction in price and higher efficiency, especially in the small cars, and a greater disposition to cater for the buyer to whom a car is a necessary part of the equipment for carrying on his business or profession. The growth of the demand for motor cars with an efficient and durable chassis, and comfortable all-weather body, at prices that the man of moderate means who has to earn his living can or ought to afford is being realized, even by some firms which have hitherto looked for purchasers among people with fat purses to whom cars are mere matters of convenience or parade. Medical men now have a long list of reliable cars from which to make their choice.

DELEGATION FROM THE UNIVERSITY OF STRASBOURG.

SEVEN members of the medical faculty of the recently reconstituted French University of Strasbourg have visited the United States, and are now in Great Britain as the guests of the Rockefeller Foundation, the object being to give them an opportunity of studying the organization and teaching methods of American and British universities and medical schools with a view to the coming reorganization of their own university. The delegation will be in this country from October 29th until November 8th. During this time members of the party will study work in their respective subjects at some of the medical schools in London and in the universities of Cambridge, Oxford, and Glasgow; the arrangements are being made by the Medical Research Council on behalf of the Rockefeller Foundation. The party consists of Dr. Georges Weiss, dean of the faculty and professor of biophysics; Dr. Léon Blum, professor of clinical medicine; Dr. Paul Bouin, professor of histology: Dr. Camille Duverger, professor of ophthalmology; Dr. Pierre Masson, professor of pathological anatomy; Dr. Maurice Nicloux, professor of physiological chemistry; and Dr. Lucien Pautrier, professor of dermatology.

SMALL-POX IN LONDON.

LAST week we published Dr. Hamer's report, submitted to the London County Council on October 24th, regarding cases of small-pox which had occurred in Stepney, West Ham, and Dartford. Subsequently the disease was discovered in Poplar workhouse, and Dr. H. A. Macewen of the Ministry of Health at a meeting with the Board of Guardians reported that some twenty cases had occurred and been removed for isolation. On October 31st the Poplar medical officer reported five more cases, all in the workhouse. The diagnosis of all the cases as they arise is being reviewed by Dr. Wanklyn, of the London County Council. Many of the cases are of severe type. The workhouse outbreak need not create great alarm. In such an institution every individual, whether inmate or officer, can easily be kept under observation and dealt with as may be advisable. We have no doubt that the guardians are in this matter accepting the advice of Whitehall as to vaccination, isolation, and surveillance of contacts. The five new cases reported on October 31st would belong to the first crop from the original source. The object now must be to prevent a second crop, and that, we trust, will be, in the circumstances of the workhouse, successfully accomplished. The more alarming fact is the appearance of the disease in so many different localities—Stepney, West Ham, Dartford, and Poplar—and also the circumstance that confluent cases are included in the outbreak. To search for contacts in these crowded populations,

with the class which they include, cannot but be a difficult matter, and the outcome will be watched with some anxiety. Meantime the prudent should make certain that they and their children and dependants are secured against the infection by immediate vaccination. Why the public vaccinator did not take care that he himself was protected is the most puzzling thing in the whole outbreak.

HUXLEY LECTURE.

Owing to the indisposition of Sir Arthur Keith, F.R.S., the Huxley lecture which was to have been delivered at Charing Cross Hospital Medical School on Wednesday next, November 8th, has been postponed.

The new *x*-ray department of the Manchester Royal Infirmary will be formally opened on Friday, November 18th, at 2.30 p.m., by Sir Humphry Rolleston, who, with the members of the Electro-Pathological Section of the Royal Society of Medicine and the Röntgen Society, will be visiting Manchester.

THE GENERAL ELECTION.

The position of parties at the approaching General Election is confused. The Conservative Party (C.), also spoken of as Unionist (U.), and the Labour Party (Lab.) have been before the constituencies for a good many years, and their position is fairly well defined. In addition there is the Liberal Party, which seems to be divided into two wings, one led by Mr. Asquith (L.) and the other by Mr. Lloyd George, which is known as the National Liberal Party (N.L.).

The following is a list of medical candidates so far as we are at present able to ascertain. We shall be glad to receive additions and corrections.

*Dr. C. Addison (L.), Shoreditch
Dr. R. Ambrose (Ind. Lab.), Whitechapel
Dr. H. Wansey Bayly (Ind. U.), Sutton, Plymouth
Dr. H. B. Bates (U.), Newton, Lancs.
Dr. Ethel Bentham (Lab.), Islington East
Sir George Berry (U.), University of Edinburgh
Dr. H. B. Brackenbury (L.), Walthamstow East
Dr. W. A. Chapple (L.), Dumfries
Sir John Collie (N.L.), Partick
*Dr. W. E. Elliot (U.), Lanark
*Dr. F. E. Fremantle (U.), St. Albans
Dr. L. Haden Guest (Lab.), Southwark North
Mr. Somerville Hastings, M.S. (Lab.), Epsom
Dr. C. W. Hayward (L.), Kensington North
Dr. Sidney C. Lawrence (C.), Combined English Universities
Dr. H. D. Levick (N.L.), Middlesbrough
Sir William Milligan (L.), Salford West
*Major J. E. Molson (U.), Gainsborough
Dr. R. O. Moon (L.), Wimbledon
Dr. H. B. Morgan (Lab.), Camberwell North-West
*Dr. D. Murray (L.), Western Isles
Sir Sydney Russell-Wells (U.), University of London
Dr. V. H. Rutherford (Lab.), Sunderland
Dr. A. Salter (Lab.), Bermondsey
Dr. R. W. Simpson (L.), Newcastle-upon-Tyne North
Dr. George E. Spero (L.), Leicester West
Dr. E. H. Stancomb (Ind.), Southampton
Dr. D. F. Todd (U.), Chester-le-Street, Durham
Dr. T. Watts (U.), Withington
*Sir William Whitla (U.), Queen's University, Belfast
Dr. J. H. Williams (Lab.), Llanelly
Dr. R. M. Wilson (L.), Saffron Walden

* Represented the constituency in the last Parliament.

Among the new candidates Dr. H. B. Brackenbury (Walthamstow East) and Sir Sydney Russell-Wells (University of London) have been approved by the British Medical Association. Among the old members who are standing again are Sir Henry Craik (Scottish Universities), Sir William Whitla (Queen's University, Belfast), Dr. Walter Elliot (Lanark), and Dr. F. E. Fremantle (St. Albans); all of them have done yeoman service in the House of Commons for the profession, and have frequently given assistance to the British Medical Association in representing the views of the profession to Parliament.

British Medical Association.

COUNCIL DINNER.

The British Medical Association made a departure on October 25th by the inauguration of a Council dinner, which it is intended shall be an annual event. It is designed for recognition of the Past President and any other retiring officer at the end of his term and to bring together, in converse with the Council, Ministers, the heads of learned societies, and others with whom the Association is in touch.

The dinner took place at the Grand Hotel under the chairmanship of Dr. R. A. Bolam, Chairman of the Council, who explained that, owing to the political crisis, several Ministers (who had accepted invitations) and a number of members of Parliament had other more pressing engagements and had sent letters of regret.

The following guests of the Association were present:

Professor David Drummond, C.B.E., D.C.L., retiring President; Right Hon. E. Shortt, K.C., M.P.; Sir Humphry Rolleston, K.C.B., President, Royal College of Physicians of London; Sir Anthony Bowlby, K.C.B., K.C.M.G., President, Royal College of Surgeons of England; Sir William Hale-White, K.B.E., President, and Sir J. Y. W. MacAlister, Secretary, Royal Society of Medicine; Surgeon-General W. B. Slaughter, Master of the Apothecaries' Society; Lady Barrett, C.B.E., President, Medical Women's Federation; Sir Arthur Robinson, K.C.B., First Secretary, Ministry of Health; Sir George Newman, K.C.B., Chief Medical Officer, Ministry of Health; Right Hon. Sir Henry Craik, K.C.B., LL.D., M.P. Sir Philip Magnus, Bt., M.P.; Dr. W. J. Howarth, Past President, Society of Medical Officers of Health; Dr. J. G. Fitzgerald, Chairman of Council, Irish Medical Schools' and Graduates' Association; Dr. C. Hubert Bond, Commissioner, Board of Control; Air Commodore D. Munro, C.I.E., Director, R.A.F.M.S.; Lieut.-Colonel Nathan Raw, C.M.G., M.P.; Sir S. Squire Sprigge, Editor of the *Lancet*; Sir William Gyn-Jones, Secretary, Pharmaceutical Society.

Sir William Macewen, President of the Association, in giving the toast, "The Common Health," said that when he wired acceptance of the duty the telegraph clerk interpreted the words in his handwriting as "The Common Wealth." That man was a philosopher, for wealth was to a large extent a matter of health. Many persons very wealthy, in the ordinary acceptance of the term, were not healthy. Gold often produced decadence. He understood that the permanent secretary to the Ministry of Health would respond to the toast, and he assumed that the responsibilities of this Department embraced everything. Our old world (which was a kind of aeroplane), when it went gyrating through space, picked up dust storms that astronomers said were got from sand, and, although these particles were so finely divided that there was not an instrument sufficiently intricate to detect them, yet the Ministry of Health must have prescience to foretell what would come from them. So also as to those little canisters containing chemical substances labelled "wild duck"; from them they were expected to trace botulism. He did not know where investigation was going to stop. They all ought, however, to look to several matters about which they had common concern. The Association had especially to consider two very prevalent diseases regarding which certain theories had been formulated and put before the public, and a very great deal would be done if they could be got rid of. One was syphilis; the other tuberculosis. As to the first named, if it were not stopped, a crime was committed against posterity. The question was sometimes asked, "Where to draw the line?" He drew no line: the disease must be got rid of by whatever means were necessary. Tuberculosis was not so easily dealt with. But the profession had a great responsibility. If the British Medical Association with its 25,000 members made up its mind as to the means it would carry great weight. He wondered whether the medical profession had not hitherto just relied upon polemical discussions instead of pushing matters to logical conclusions and then pressing them upon the Government and the officials who had to carry them out. Much of this disease, it was said, came from cows through milk, and about 50 per cent. of the tuberculosis in children was bovine. If so, how did it come from the cow? Surely it must be through the milk. Tubercle was incubated in byres as directly as in an incubating chamber. The best temperature in which to keep cows, it was said, was 70° F., and in byres were found the three other conditions in which tubercle easily propagated itself—namely, darkness, dirt, and damp. From such places, in such

conditions, came milk given to children. Surely, if 25,000 medical men acted in concert some action might be taken to end that form of tuberculous disease. And if they got rid of 50 per cent. of the disease that way they ought to be able to get rid of a good deal that came by transmission from one person to another. Sir William Macewen went on to remark that the British were a strange people. They taxed the air they breathed. Formerly they used to tax the light which came into the houses through the windows. Now, in effect, the cubic capacity of houses was taxed. God had given every single soul that came into the world as much air as it could breathe, but it was curtailed in this way. Those who got tubercle from confinement were put into sanatoriums where they could get just the fresh air God had given. Would it not be better to commence the other way and give the children and others as much fresh air as they could breathe? These were points which required consideration, and he thought it a good thing to ventilate them on that occasion. He coupled with the toast the name of Sir Arthur Robinson, First Secretary of the Ministry of Health (paying high tribute to the permanent civil servant whose work continued while Ministers came and went), and he also associated with it the name of Sir Anthony Bowlby, President of the Royal College of Surgeons, who did much good service at the front, and whose methods were a little more direct.

Sir ARTHUR ROBINSON hoped he would be in order in offering an expression of sympathy with the company. Instead of the solid substance of a Minister of the Crown they had to be content with the pale and embarrassed shadow of a permanent civil servant cast for a somewhat unwonted task. However, replying to such a toast as the Common Health was one that should inspire even a silent civil servant to something rather above than beyond his ordinary performance. Sir William Macewen had said that it was time that something was done in regard to the milk supply. Well, the Department had put on the statute book a measure which, though not heroic or final, would be valuable. The underlying principle was to make it worth while to supply better milk. Provide a man with inducements to supply good milk and it was common sense to suppose that he would do so. He could say also as to tuberculosis that there was a policy. It had its limitations, but by reason of it the notifications had gone down and were going down, and the death rate had gone down and was going down. Speaking generally, Sir Arthur Robinson said that the Ministry of Health had been in existence only a short time and had done a great deal. Something like 200,000 houses had been or were being built, and nothing like that had been done before through a department. The Ministry had also made a fair start in dealing with the problems of slum areas. Then there was the question of the voluntary hospitals. In a period of unexampled difficulty they had prevailed on the Government to give a sum of half a million sterling to set going machinery which was gradually bringing the voluntary system round, and it had made possible the continuance of the voluntary system in fact and not merely in name. Broadly, the problem of public health seemed to him one of fitting various parts into a whole. It was a problem of mutual tolerance, of mutual forbearance, and of working together for one end. Unless they did this on the basis of giving each element in their policy full weight the policy would be wrong. The Ministry of Health presided over the whole public medical health service. It was in close relations with the whole mass of general practitioners through the insurance services. There they had a body which dealt with private persons and with public health, appreciating the different view-points and getting progress by unity. He appealed for the co-operation of the medical profession as represented by the British Medical Association.

Sir ANTHONY BOWLBY said he represented one of the two English Royal Colleges concerned with the education of medical men. In this connexion the Colleges did two things—they examined and they set the pace (the curriculum) for the different medical schools of the United Kingdom. During the year the two Colleges had spent much time in rearranging the curriculum, the main object being to give more time to the most important subjects—those in the final examination. The task of the present-day student was very difficult. That individual, he rather thought, looked upon the whole performance from the point of view of an obstacle race. The student saw in front of him a long way off—five or six years distant—the winning post. In an obstacle race all sorts of things were put in the way of a competitor to delay him. The student found the biology examination to begin with. Then came the chemistry and physics people, who might put up a better barrier, and sometimes succeeded. After the next obstacle—anatomy—came a greater, physiology. For whereas anatomy was a fairly accurate science, and the femoral artery of to-day was very much where it was a hundred years ago, the physiology of to-day was quite a different thing. Twenty or thirty years ago they thought they knew something about the processes of digestion and the action of the heart and respiration, but it now appeared that they did not. So there was reason to pity the poor candidate. Having surmounted these obstacles he entered upon the last lap. This used to comprise medicine and surgery and obstetrics. Now innumerable special subjects were added, so that one might wonder and think how "still the wonder grew that one small head could carry all he knew." It was indeed a severe task; yet, in spite of the difficulty of seeing the wood for the trees, in spite of the fact that a large number of young men knew a great deal about abstract and special subjects without knowing much about general practice, in the long run the educated medical man of the present day was a strong stand-by and supporter of the public health of this country. Finally the young man became a full-blown medical practitioner, and then he sought the advice of those in practice. One piece of advice he would give to every young medical man, and that was to join the majority—not in the proverbial sense, but to join the majority of the profession, the British Medical Association. They would thus get in touch with their fellows—an important matter in the medical profession—and would have assistance and advice when necessary from older members. If the newly qualified men went into any of the services, there was still another reason why they should join the Association. In recent years the action of the British Medical Association had obtained great benefits for the Army and Navy Medical Services, the Indian Medical Service, and the Colonial. In all these departments the Association had been of very great assistance to medical men, and he hoped as in the past, so in the future, a very large number of qualified men would become members.

Dr. R. WALLACE HENRY gave "The Retiring President," and said that for many years it had been the custom for the President to enter upon his term of office in a blaze of glory. He had given his presidential address surrounded by civic dignitaries and distinguished men of science, clad in garments of many colours. But he had gone out of office so quietly that it might almost be said he was "unwept, unhonoured, and unsung." This year the Council had decided that such practice should come to an end, and that each year a dinner should be arranged at which one of the principal toasts should be "The Past President," and in paying tribute that night to Professor Drummond they were making a start with one whose name would rank high amongst the eminent men who had held that office. It was many years since he left his native land of Ireland, and at a very early period of his professional career Professor Drummond began to make his mark. He had the opportunity at the Meath Hospital at Dublin of working under that distinguished heart physician, Sir William Stokes, one of whose favourite house-physicians he was, and what he learned and studied there he took into his private practice when he went to the north of England. He wrote many articles dealing in various aspects with his favourite subject (heart disease), one in particular on aneurysms of the thoracic arch. But his studies were not confined to the heart. He turned his attention to nervous diseases, and one of his works was a standard book upon diseases of the brain and the spinal cord. His reputation in Newcastle rapidly grew, and he became physician to the Royal Victoria Hospital. His reputation spread abroad. He had received many distinctions from foreign countries. It was not true in his case that the prophet was without honour in his own country, for he had been made Principal of the College of Medicine at Durham University as well as Professor of Medicine there, and now held the post of Pro-Vice-Chancellor of that University. Last of all, within the past two months, appreciation of his services in Newcastle-on-Tyne had been marked by his being appointed Chairman of the Voluntary Hospitals Committee of that area. So much in brief for his purely professional work. In the British Medical Association he must be one of the oldest members: he had been enrolled forty-four years. As had been the case with a very large number of students at Dublin University and at Queen's College, Belfast, it had been preached to him and his colleagues that almost as soon as they had qualified one of their first duties was to join the British Medical Association. Would that the same thing could be done at all the universities in Great Britain also!

Professor Drummond had been formerly a member of the Council of the Association, had been Secretary of the North of England Branch and at one time President, and it was partly due to his work in connexion with these offices that the Branch held such a distinguished place in the Association for the splendid work it had done. They would drink his health, not merely as a great physician, not merely as Past President of the Association, but also as "David Drummond the man." They all regarded him with affection and esteem.

Professor Drummond said it was a great pleasure to him to meet so many distinguished colleagues; and this was enhanced by the fact that he was the recipient of their hospitality on the occasion of the inauguration of a function which he hoped had come to stay. He went on humorously to depreciate the tribute just paid to him by Dr. Henry as the general compliment of one Irishman to another, and then spoke of the great interest of the period—three years—of his official connexion with the Association as President-elect, President, and Past President. The Annual Meeting formed a very important part of the proceedings, and their meetings at Cambridge, Newcastle-on-Tyne, and Glasgow had been held to be as successful as any they had had for many years. In recalling the gathering at Cambridge he evoked applause by referring to the great personality of the great President of the year (Sir Clifford Allbutt).

The Chairman submitted the toast of "The Visitors," very happily referring to their widely representative character and expressing the hope that from year to year they would have present, amongst others, the Ministers with whom they dealt in other circumstances, perhaps not quite with the cordiality with which the welcome was given that night. He entirely agreed with Sir Arthur Robinson, that these meetings would promote in every way friendship and co-operation, than which nothing was more needful to the country in these years of strain. Coupling the toast with the names of Mr. Shortt and Sir Henry Craik, the Chairman spoke of the sympathy which Mr. Shortt had manifested as Home Secretary for their work, and expressed gratitude to Sir Henry Craik for wise counsel and kindly help in his capacities as an experienced parliamentarian.

Mr. Shortt, replying in light vein, questioned whether he ought to be there, as the invitation had come to him when he was Home Secretary, but he assured the company that he had greatly enjoyed the evening, and also touched on the satisfaction of being relieved from the cares of office. A Home Secretary who tried to do his duty made enemies every day of his life. Everything he did annoyed somebody, and those who were pleased with what was done generally took it as a matter of course.

Sir Henry Craik said that for seventeen years the medical profession had tolerated him as a humble representative in Parliament of twelve thousand of their members. The British Medical Association had conferred upon him the great honour of making him an honorary member of their society, and they had further gratified him by admitting him to their counsels. He had learned much thereby. He recognized that the two great objects for which the Association lived were the maintenance of scientific truth in its highest form and the pursuit of research for the good of mankind. He had found also that, according to the scripture phrase, truth was joined with mercy. The maintenance of the kindliest relations between the great medical services and those whom they served was the principle upon which they lived, thrived, and did their work.

Sir Jenner Verrall submitted the health of the Chairman, speaking in the highest terms of his qualities, and the toast was received with musical honours.

Dr. Bolam, responding, said that this toast was given against his ruling. Service for such an Association was a great privilege, and he was happy in performing it.

The Loomis Sanatorium, New York, has recently celebrated its twenty-fifth anniversary, and has published in commemoration a "birthday book," giving a description of the foundation, the growth, and the progressive enlargement of the institution. A special block has been erected at the expense of the Standard Oil Company for the treatment of its employees. In formally handing this over to the sanatorium, the vice-president of the company suggested that this course might well be followed by the other large commercial houses of the United States, for not only would the treatment of tuberculosis be better carried out, but the cost would be less if borne by private firms than if controlled by the Government.

Scotland.

Parliamentary Representation of Universities.

It is thought improbable that there will be any contest at this general election for the representation of the Scottish Universities in the House of Commons. There are three seats; Sir Henry Craik and Mr. Cowan are standing again, and Sir George Berry, consulting ophthalmic surgeon to the Royal Infirmary, Edinburgh, is offering himself in the place of Sir Watson Cheyne, who decided some time ago not to seek re-election.

Botulinus Antitoxin.

In view of the recent outbreak of botulism at Loch Maree the Scottish Board of Health has under consideration arrangements to render available a supply of botulinus antitoxin in the event of the occurrence of any further cases in Scotland. There is no reason at present to expect further outbreaks, but the gravity and mortality of the disease may be such that it is considered that arrangements should be made to provide a supply of antitoxin which could be obtained more promptly than if the only available supply were held in London or Edinbugh. It is pointed out that the only remedy at present known for botulism is botulinus antitoxin given by injection, but that it is unlikely to save life if the disease has progressed to a late stage. It is therefore of the greatest importance to give the antitoxin at the earliest possible moment—that is to say, as soon as symptoms of blurred or double vision, giddiness, ptosis, difficulty in speech or swallowing, suggest the diagnosis of botulism. The effectiveness of treatment by antitoxin for this disease is so greatly increased by intravenous injection that this method of administration should always be employed, if possible; otherwise the intramuscular method should be used. It may be necessary to administer subcutaneously a preliminary injection of a small quantity of the antitoxin (0.5 c.cm. of antitoxin, or 8 minims) to test the reaction of a patient, in order to avoid the risk of serious symptoms arising in persons highly sensitive to horse serum. If the patient is sensitive the antitoxin must be given with caution, and the dose should be considerably reduced, the first intravenous injection of 0.5 c.cm. of antitoxin being diluted with 50 c.cm. of saline. Only large doses of antitoxin will save acute cases; the ordinary intravenous dose should be from 20 to 50 c.cm. of the antitoxin: it should be previously warmed to body temperature and injected very slowly. This amount may be repeated daily if necessary. On the occurrence of an outbreak of botulism it may be deemed necessary by the medical attendant or the public health authorities that all persons who have consumed the suspicious food should be given a prophylactic dose of antitoxin (10 c.cm. intramuscularly) even though they may not present symptoms of the disease. The Board of Health has accordingly made arrangements for a small stock of the antitoxin to be kept at the following places, as well as at the offices of the Board in Edinburgh: the City Hospital, Aberdeen; King's Cross Infectious Diseases Hospital, Dundee; City Hospital, Edinburgh; Belvidere Hospital, Glasgow; the medical officer of health, County Buildings, Dumfries; Mr. Macdonald, Mayor's Drug Store, 31, High Street, Inverness; and the County Hospital, Motherwell, Lanarkshire.

The Grading of Milk.

The Milk and Dairies (Amendment) Act, 1922, authorized the Scottish Board of Health to make an Order in regard to licences for the sale of graded milk. The Board has now issued, to producers of higher grade milk and others, a memorandum showing the principal conditions under which the statutory Order will be made. Before issuing this the observations of those interested were invited. The Milk and Dairies Act, 1922, contemplates four grades of milk in Scotland—namely: (1) certified milk; (2) grade A (tuberculin tested) milk; (3) grade A milk; (4) pasteurized milk. It is proposed that the administration in regard to all four shall be placed in the hands of local authorities under the Public Health (Scotland) Act, 1897.

Certified Milk is milk obtained from tubercle-free cows and bottled at the farm.

Grade A (Tuberculin Tested) Milk is the same as Certified Milk, except that it is not bottled at the farm.

Grade A Milk is milk obtained from herds which have been examined at least three times a year at the farmer's expense by a veterinary surgeon, but the examination will not include tuberculin tests.

No particular make of pasteurizer is prescribed, but the milk must be retained at a temperature of not less than 145° and not more than 150° F. for at least half an hour, and be immediately cooled to 45° F. This condition applies only to milk sold under the designation "pasteurized." Tuberculin tests for the first two grades will be carried out at the expense of the farmer. A score card inspection will be made by the local authority in connexion with certified milk, and annual fees will be payable in respect of all grades, in order to cover some of the expenses incurred by local authorities. The milk when delivered to the consumer, must not contain more than a specified number of bacteria.

University of Edinburgh General Council.

While no subject of exclusively medical interest engaged the attention of the General Council of the University of Edinburgh at its statutory half-yearly meeting on October 27th, in several matters medicine had an important stake. This was so, for instance, in relation to the draft of regulations for the preliminary examinations which had been drawn up by the Scottish Universities Entrance Board. It was pointed out by the Rev. Professor W. P. Paterson that one language was compulsory among the subjects of examination, but that there was no compulsion that this language be Latin; this would be a blow to Scottish culture. Sir Richard Lodge stated, in reply, that the inclusion of compulsory Latin would be inconsistent with uniform admission to all faculties; but Latin as a subject could be imposed by the University in connexion with particular classes and was not barred. Approval was given of the draft regulations. Principal Sir Alfred Ewing, who presided, supplied the matriculation figures up to the preceding day (October 26th), and compared them with the completed figures for 1921–22; they were as follows:

	1921–22.	1922–23.
Arts	1,574	1,548
Science	974	742
Divinity	75	64
Law	198	172
Medicine	1,838	1,408
Music	10	18
	4,669	3,952

Glasgow and West of Scotland Overseas Medical Club.

The annual dinner of the Glasgow and West of Scotland Overseas Medical Club was held on October 27th in the Grosvenor Restaurant, Glasgow, when the president, Dr. J. Livingstone Loudon, T.D., officiated as chairman of a representative gathering. The president and secretary of the sister club in the east of Scotland, Mr. H. Wade, C.M.G., D.S.O., and Mr. W. T. Gardiner, M.C., were present as guests of the club. As on former occasions, the opportunity for the renewal of old service associations was much enjoyed, and the musical entertainment provided by Drs. T. D. Laird, Wallace Anderson, C. G. Macartney, J. Scouler Buchanan, and W. T. Gardiner was duly appreciated.

Central Midwives Board.

At a special meeting of the Central Midwives Board for Scotland for the hearing of penal cases, with Dr. James Haig Ferguson in the chair, a certified midwife was cited to appear in respect of failure to notify contact with a person suffering from puerperal fever, thereby endangering the lives of her other patients, and for other breaches of the rules. The Board found the charges to be proved, and instructed the secretary to cancel her certificate and to remove her name from the Roll.

Victoria.

Australasian Medical Congress, 1923.

Presidents of Sections in connexion with the first Australasian Medical Congress, organized by the Branches of the British Medical Association in Australia, have now been definitely appointed, as follows:

Medicine.—Dr. W. Marshall Macdonald, Dunedin.
Surgery.—Mr. R. Gordon Craig, Sydney.
Obstetrics and Gynaecology.—Dr. J. A. Cameron, Ipswich.
Pathology and Bacteriology.—Professor J. B. Cleland, Adelaide.
Preventive Medicine and Tropical Hygiene.—Dr. F. S. Hone, Adelaide.
Ophthalmology.—Mr. D. D. Paton, Perth.
Otology, Rhinology, and Laryngology.—Dr. T. S. Kirkland, Sydney.
Neurology and Psychiatry.—Dr. A. W. Campbell, Sydney.
Diseases of Children.—Dr. R. B. Wade, Sydney.
Naval and Military Medicine and Surgery.—Colonel W. W. Giblin, Hobart.
Dermatology.—Dr. R. E. Harrold, Adelaide.
Radiology and Medical Electricity.—Dr. Valentine McDowall, Brisbane.

As a preliminary step to the election of Presidents of Sections the Branches of the British Medical Association in the various States of Australia and New Zealand were invited to forward nominations, and from these the above were finally appointed by the Executive Committee of the Congress.

The meeting will be held in Melbourne in November, 1923, under the presidency of Mr. G. A. Syme, and any members of the British Medical Association resident in Great Britain and Ireland who may find it convenient to attend will be very cordially welcome. The general secretary is Dr. A. L. Kenny, 13, Collins Street, Melbourne.

Post-graduate Work.

Encouraged by the great success of, and the large attendances at, the recent series of post-graduate lectures on the nervous system and its diseases, the Melbourne Permanent Committee for Post-graduate Work has organized a second series on obstetrics, to be held at the Women's Hospital in September and October. This series is being specially conducted in connexion with the examinations for the degree of Doctor of Medicine, University of Melbourne.

The New Anatomy Department of the University of Melbourne.

The new anatomy department, designed to accommodate 600 students, was commenced in January, 1922, and is making fairly rapid progress. The building is in brick, with stone facings, and is Tudor in type. There are two dissecting rooms, each capable of accommodating 300 students, a large and well-lit museum, a theatre to hold 300 students, reading rooms, cloak rooms, and retiring rooms for men and women students. On the entresol floor, between the two dissecting rooms, are the private rooms for the staff, so placed that they command both dissecting rooms. On the upper floor there is a large and well-lit histology laboratory, capable of accommodating 250 students, together with private rooms and research laboratories for the histology staff. There are in addition rooms for operative surgery, neurology, and physical anthropology, and museum preparation rooms, with ample provision for the preservation of subjects and the storage of anatomical material. A special feature of the building is the flat roof over the histology department, from which will be obtained a magnificent view over Melbourne and Port Phillip Bay. There can be no question that the new building will prove of great utility to the University and the medical profession, and will be a decided acquisition to the City of Melbourne. Its utility would have been considerably enhanced had the University council carried out its own resolutions of 1914–15 and erected the building—in accordance with the unanimously expressed wish of the profession—alongside a hospital, instead of within the University grounds. In 1914 the whole medical school could have been re-erected alongside a hospital for about £30,000 more than the present building actually cost (that is, for £100,000) as against the present estimated cost of £70,000 for the anatomy department.

Paris.

[From our Correspondent.]

With October the official medical life begins again. Our faculty has not yet opened its doors to the young students, but they have already been opened to the old students—we practitioners who have flocked to certain congresses in Paris.

French Congress of Surgery.

To take the national congress of surgery first; at this annual meeting the surgeons of the whole of France are brought together in Paris. This year Professor Hartmann was president. Without entering upon a critical review of the proceedings of the congress, I would emphasize one fact that must strike every spectator—the position occupied by the younger generation of surgeons. They have been formed by the war. They were then called upon to play the part of

chefs de service in departments where activity was unprecedented. They have learned to accept responsibility. They have found themselves! It is not surprising therefore that they took a large share in the work of the congress and presented many communications and contributed to the discussions concise, short, and lively remarks in the true surgical manner. We have in this a remarkable evolution; the after-war spirit has smashed the old surgical machine—its traditions, its hierarchy, and its methods. Is it a gain? There are always two sides to a question.

There is only one incident to note. The president refused to allow Dr. Voronoff to read his paper on rejuvenation by glandular grafts. The reason was that the lay press on that very morning had trumpeted forth a hymn of praise to the glory of the method and its inventor. The result is that Dr. Voronoff has had to continue as he began, and it is in the daily papers that we have read about the super-magnificent results of the grafting of the testicles of the chimpanzee into old men. You may guess whether writers of gossip and caricaturists have hesitated to profit from such a subject! May someone perhaps succeed in grafting the brain of a fox—and wisdom—under the human skull?

Congresses of Medicine and of Urology.

The congress of French-speaking physicians followed, under the presidency of Professor Widal. For long he has been a man of mark, owing to his scientific renown, his personal authority, and the charm of his easy speech. The mantle of his master, Dieulafoy, has fallen upon him. No one knows better than he how to guide a discussion, how to keep the main point in view, and how to sum up a question in a few decisive words. The subjects of discussion were the eternal question of ulcers in the neighbourhood of the pylorus and the new problem of deficiency diseases, looked at from the point of view of their treatment. Much has been said, but we are left with the impression that much remains still to be said! At the twenty-second French Congress of Urology, which was held at the same time, there was an interesting discussion on diverticula of the bladder.

Examinations for Resident Hospital Posts.

The competitive examinations are also starting again. As I have already explained (JOURNAL, January 7th, 1922, p. 32), the examination for resident hospital posts was completely changed two years ago, by the introduction of the principle of anonymity in the preliminary written examination. The candidate has to answer in a very limited time numerous questions bearing upon very precise points of anatomy. He is not asked for phrases, but for facts, and this enables the judges, by a simple process of marking, to award points which determine the classification of candidates and the rejection of those found unsuitable. Much was expected from such a simple and just method. There has been a great disillusion. The reason why we now see the most ardent of its promoters disenchanted is that, the test being solely a test of memory, the youngest candidates, fresh from the anatomy classes, have been greatly favoured. On the other hand, the older candidates, who, though they had gained in clinical experience, had lost in memorized scientific knowledge, have too often failed. Now the resident house-physician is called upon to become the right-hand man of his chief, and this requirement cannot be fulfilled by too young a student who nevertheless wins a usurped title. In the long run it is our patients who suffer from it, and so we have the whole question *sur le tapis* again. It is less a question of recognizing what a man *knows* than what he *is*, and anonymity, so far from being the *summum jus*, seems an unwise expedient at the first stage of the competitive examination.

Problems of the Medical Students.

It is further to be said that even the recruiting of students is difficult. Nowadays it is impossible for a medical student to begin his studies unless he has sufficient private means. It is calculated that a student cannot cost his family less than £200 a year—at the present exchange, 12,000 francs. Such a sacrifice cannot be expected from the families of professors or from those belonging to the professions commonly called liberal. The students tend, therefore, to come from business circles, and naturally to have quite a different spirit. So much money invested in studies must show financial returns, and even the belief in a professional vocation will soon have gone. This is a social danger that an increase in the number of scholarships could have avoided; but the general public does not yet understand.

The future of our medical schools must cause much anxiety. Already we are isolated as a nation. The countries with low exchanges can no longer send us students. We, ourselves, can no longer dream of visiting your teaching centres or those of America. To buy an English book seems an act of madness when as it is our students can no longer buy the textbooks they require. The world has already experienced epochs of regression.

Correspondence.

POST-GRADUATE COURSES.

SIR,—In reply to the letter by "Ambitious" (October 28th, p. 827), may I point out that the problem of post-graduate study in the provinces is being rapidly solved along the lines he suggests? Under the scheme initiated by the University of Bristol, courses of study have been or are being held at Hereford, Trowbridge, Swindon, Bournemouth, Barnstaple, and Dorchester. The initial steps have been generally taken by the local Branch or Division of the British Medical Association, which forms a small subcommittee of management. Application having been made, the University sends a circular to all medical men in the immediate vicinity of the proposed centre. This circular gives full details of the proposed course of study, time and place of meeting, etc. The subjects of the demonstrations have generally been selected by the subcommittee from a long list supplied to them by the University. The meetings are usually held in the late afternoon, and always at the local hospital. They are carried on by a lecturer selected by the post-graduate committee of the University, who visits the centre one day a week.

In some towns in the West of England where there are large hospitals which are not, however, teaching schools, the procedure is somewhat different. Either the neighbouring practitioners are invited to join in the medical and surgical rounds on one particular day of the week, or post-graduate lectures and demonstrations are given by the members of the honorary staff, with any such outside help as may be needed. In the SUPPLEMENT of October 28th (p. 163) it was announced that such a course is to be held at Plymouth, beginning on November 8th. Such a plan as the above can be carried out in any district within a few hours' journey of a medical teaching centre, and if any difficulty in obtaining facilities arises application should be made to the Science Committee of the British Medical Association, which has now taken over the duties of the old post-graduate committee.

In conclusion, may I say that such courses cannot be made free, as "Ambitious" suggests. There are expenses of advertising, postage, hire of room, etc., and it is only just that the lecturers coming from a distance should be paid a small fee and their travelling expenses. In the West of England the attendance on such demonstrations has been so good that the subscription can be fixed at about two guineas.—I am, etc.,

J. ODERY SYMES,
Chairman, Medical Post-graduate Committee,
University of Bristol.

Bristol, Oct. 30th.

X RAYS IN HYPERTRICHOSIS OF THE FACE.

SIR,—The selective and permanent destruction by *x* rays of normal hair follicles, without damage to other structures in the skin, is at present a technical and histological impossibility.

The assertion is dogmatic, but will not, I think, be challenged by any of my dermatological colleagues, none of whom, to the best of my belief, have ever advocated this treatment in uncomplicated cases of facial hirsuties. That it is, however, being practised in certain quarters is evidenced by the fact that I was recently consulted by a lady who had been receiving the treatment in London (incidentally, without benefit) for the past eighteen months. The operator in this case presumably knows the risk he is running, and my protest is not so much directed to him as to the general medical practitioner, who may in the future be approached and persuaded by his patients to allow them to submit themselves to radiotherapy for hirsuties, because "their friend Mrs. —— was cured in a pleasant and painless fashion."

The following case, at present under my care, illustrates

with remarkable fidelity to textbook description all the risks that the procedure may entail:

The patient, a nursing sister, in June-July, 1911, received, without medical authority, twelve doses of *x* rays at weekly or ten-day intervals for hirsuties of the face. The operator, who is known to me as a person of great experience and ability in this line of work, assures me that at the time there was no undue reaction or irritation, and both she and my patient are in agreement that the epilation was successful and satisfactory in every way. There has been no regrowth of the hair in the eleven and a half years that have since elapsed, but in June, 1914—*exactly three years after the first session*—"small red spots, resembling the naevi that are seen in babies," began to appear on the chin, and these have gradually spread to the cheeks and neck until, as at the present time, the whole chin, the mandibular area, and the anterior and lateral cervical surfaces are covered with these vascular points, while the skin itself is atrophic, dry, and scaly, and exhibits a patchy alteration of the normal pigment distribution, being a papery white in some places and hyperpigmented in others.

Subjectively there is "severe irritation, especially at night," "a pricking sensation like hot needles," and a dry feeling of the whole irradiated areas, "as if the sweat glands had been destroyed"—as in actual fact is the case.

In brief, the patient suffers from an *x*-ray burn which amounts to a severe disfigurement, but this is not the sum-total of her disability. Over the thyroid cartilage, at its most prominent part, there is continuous exfoliation with pronounced cicatricial contraction, "woody" infiltration, and adhesion of the dermis to underlying structures. The condition prevents full extension of the neck, and is so tender that a collar cannot be worn.

In my opinion the dermatitis here present may subsequently undergo malignant changes, and with the object of forestalling such a catastrophe the patient has agreed to undergo an operation for excision and plastic repair of the adherent parts of the skin.

In summarizing the main issues at stake, I would again assert—

1. That *x* rays, while selective up to a point, cannot be relied upon in the present state of their physical application to differentiate their action, in the strictly scientific sense, on normal cell structures.
2. It follows, therefore, that they should not be used with the sole object of combating facial hypertrichosis. I would go farther, and maintain that their employment in such cases is unjustifiable, and a direct contravention of the accepted adage, "primum non nocere."
3. The latent period in the evolution of *x*-ray stigmata, after the cure of the primary indications for their use, is a complex and indeterminable coefficient, in which the penetration power of the rays employed and the cutaneous idiosyncrasy of the individual patient are factors of prime importance.

It would seem, therefore, that where destructive doses have been employed the operator can never guarantee his patient against the ultimate appearance (at an uncertain date) of one or more of the stigmata illustrated by my unfortunate patient. It is only in cases of malignant disease that destructive as opposed to inhibitory radiotherapy (as for acne, keloid, oily seborrhoea, etc.) is justifiable.—I am, etc.,

London, W., Oct. 27th. HENRY C. SEMON.

TREATMENT OF LEPROSY.

SIR,—Many articles and reviews of books and papers have appeared in medical journals on the treatment of leprosy by injections of soaps of the fatty acids of chaulmoogra oil, or the esters of this oil. This treatment has been lauded as though it will effect a cure for the majority of patients. There have been many "cures" for leprosy, and each has received great praise. Perhaps the present cure has received more attention than any other, yet many of us have not forgotten how nastin and benzolyl chloride were extolled about sixteen years ago. I know a number of medical men who have persevered with the treatment by gynocardates in leprosy, and have not had good results.

This treatment has been tested extensively in Ceylon, but with disappointing results. Dr. Muir's preparation, named "ecco," was tried for many months on a large number of patients in the leper asylum; the medical superintendent and his assistants kept very careful records and charted the distribution of the skin lesions and the changes in the sensations of each patient every month. But after many months the results were so disappointing that no pronouncement could be made as to whether the treatment was of any value or not. I think that three points have received too little attention:

1. That most who become infected with leprosy undergo a natural recovery, and that the earliest stages of the disease are very common in the inhabitants of countries where leprosy is rampant. If a number of the lower classes of such a country as Ceylon are examined it will be found that many of them show such early signs of past leprosy, as: (*a*) patches of anaesthesia; (*b*) wasting of the thenar and hypothenar eminences; (*c*) loss of toes; (*d*) slight thickening of the ulnar nerves. Most of these patients have recovered from the infection, but not from all the results of it.
2. That most of the lepers, who are segregated, are in the later stages of the disease.
3. That the disease in its attack upon a patient waxes and wanes, and that natural cures are far more common than is usually believed.

In some respects leprosy is comparable with tuberculosis, in which disease so many recover from the early stages. The praise that this treatment has received has raised the hopes of thousands of lepers, who I believe are doomed to bitter disappointment.—I am, etc.,

LUCIUS NICHOLLS, M.D.Cantab.,
Director of Bacteriological Institute, Ceylon.

Fulbourn, Cambridge, Oct. 28th.

VACCINE TREATMENT OF CHRONIC BRONCHITIS.

SIR,—I have read Dr. Mackey's paper (October 21st, p. 715) on this subject with interest, as I have been treating cases of the kind in this way since 1909. Initial enthusiasm is apt to be damped down from time to time, but if it has a substantial basis to rest upon it ultimately burns less brightly, perhaps, but with a steadier light. In spite of failures I can in the main confirm Dr. Mackey's estimate of the utility of this treatment. If I were now compelled to treat these patients with stock expectorant mixtures only, I should feel pretty much like a pugilist whose right hand was tied behind his back. I think the real point of interest to-day, in connexion with chronic or recurring catarrhs of the respiratory tract, is not whether vaccine therapy is useful in the majority of cases, but why it fails in a minority. I wish to direct attention to some causes of failure.

During the war I prepared autogenous vaccines for some 30 to 40 cases of chronic bronchitis in soldiers. There was no appreciable improvement in any of them. They had all been "gassed." I should be interested to learn whether others have been more successful. Where one has to deal with advanced emphysema, bronchiectasis, nephritis, or very high blood pressure it is too much to expect results which will satisfy everyone. It is true that some of these cases may be improved and occasionally I have seen a surprisingly good result; but they are difficult and uncertain. For example, I treated a patient in the Manchester Northern Hospital (Dr. Sturrock's case). There was extremely fetid expectoration and a high temperature which had persisted for many weeks. After the first inoculation there was immediate and striking improvement. The child was sent to a convalescent home in a few weeks almost well. On the other hand, I treated a similar case in Ancoats Hospital (Dr. Melland's case), with the result that the patient left the hospital after the first inoculation. The reaction was so severe that the cure seemed to him worse than the disease! This experience emphasized the necessity for minimal initial doses.

But even in uncomplicated cases of chronic catarrh one fails occasionally to do any appreciable good. Dr. Mackey's paper may supply the explanation in some cases, but may I suggest another? It is well known in large pathological laboratories that when a series of rabbits, for example, is inoculated periodically for some weeks with sheep's red blood cells, a very potent antiserum is developed in the great majority of the animals. But its potency is by no means constant, and exceptionally it may be found impossible to obtain a useful antiserum from an individual rabbit whose tissues fail to respond in an average manner. This is a fundamental difficulty in immunization which, I fear, accounts for some of our failures in apparently suitable cases of the kind under consideration.

There is another group of cases to which I wish specially to direct attention. I have treated a number of patients in this way who were said by more or less competent judges to be suffering from laryngeal or pulmonary tuberculosis. I failed, however, to find tubercle bacilli in their sputa. Some of the results were extremely gratifying. In these, I think, the diagnosis was probably incorrect. But I may recall the fact that some tuberculous patients have a history of susceptibility to recurring catarrhs prior to the development of recognizable tuberculosis and one may assume that in many of these patients closed tuberculous lesions existed when only evidence

of catarrh was present. Cure of the catarrh, by relieving them from cough—that is to say, from violent respiratory movements—favours the spontaneous cure of incipient tuberculosis. I suggest that doubtful cases of the kind should be treated in this way before being finally classified as tuberculous. If the treatment fails to do good, at all events the main cause of the failure is here made evident by subsequent developments.

Finally, failure of vaccine treatment may be due to various forms of nasal obstruction or chronic infection of one or more of the accessory sinuses. Appropriate surgical treatment is here an essential preliminary to successful vaccine treatment. I do not suppose that these causes of failure exhaust the list; they are merely those which I myself have encountered in practice.

With regard to Dr. Mackey's modification of the ordinary technique, it appears to me on *a priori* grounds to be sound. I shall certainly try it.—I am, etc.,

Manchester, Oct. 27th. J. STAVELY DICK.

THE RELATION OF ALOPECIA AREATA AND SQUINT.

SIR,—The cases of association of alopecia areata with strabismus recorded by Dr. Goodwin Tomkinson (September 16th, p. 505) and commented upon by Dr. Harford (September 30th, p. 616) tend to confirm the opinion I have formed of the cause of squint, after investigation of nearly 1,000 cases of heterophoria and squint in the past two years.

Last February I was consulted by a woman of 32 who complained of pain at the back of the eyes and swelling of the lids, the symptoms being worse when she was sewing or reading. She had 0.25 D. hypermetropic astigmatism in the right eye, 0.5 D. myopic astigmatism in the left, and had 5° latent divergence. The eyes were prominent, especially since both ovaries had been removed for cystic disease in July, 1921. She had had transient attacks of baldness since the age of 10. She could remember no emotional disturbance at that time. After the ovarian operation the hair came out "in handfuls." The eyebrows and eyelashes have fallen since the age of 25. They grow again, but are grey. Since the operation they have not grown again on the left side. She now has several large areas of baldness. She has a fibrillary twitching of the orbicularis muscles, affecting each side alternately. Afterwards she remembered that she had had a shock when she was 10 years old. Her letter is worth quoting, since it contains several items of psychological significance:

"I was staying in a little village with some friends. There was a man living in a hut on the downs near by who was very strange in his manner. Sometimes he wriggled about as he walked through the streets and along the downs. The villagers said that some years before my visit he had been bitten by a snake, and before he could get proper medical treatment some of the poison had gone over his body, and that caused him to be very strange in his manner. He always said that he felt as if snakes were wriggling over him. I was terrified of this man and always kept out of his way, although he was quite harmless. The people called him "Old Dan." One day a man called to see the friends I was staying with. I liked him very much, and was busy telling him all about my home. A little later in the evening someone whispered to me that he was Old Dan's brother. I was so frightened that I rushed out of the room to my mother, and wanted to go home at once. It was only a joke; the man was not related to him at all, but I was terribly frightened, and it took a long time for them to persuade me to stay there a week or two longer. It all seems very foolish now, but at the time I was terrified. I always had a great horror of anything or anybody that was not quite normal. This is all I can remember of the fright I had when 10 years old."

Dr. Harford has referred to my conclusion that squint is intimately related to left-handedness and stammering, either in the person or the family. The case under consideration exemplifies this. She is left-handed in a noticeable but not uncommon manner. The left hand is used for cutting out material and for cutting bread, but she holds the knife in the right hand when using knife and fork. A spoon is held in the left hand, and she is also left-handed for threading needles, but not for sewing. She would feed chickens with the left hand, but would knock a door or ring a bell with the right. The patient's mother is left-handed. Two brothers are living, one of whom stammered when a small boy. She thus suffers from latent squint and alopecia (and loss of eyebrows and eyelashes), is left-handed, and has a family history of left handedness and stammering. It would be interesting to know if Dr. Tomkinson's cases had a similar family history.

The following history of another family with similar associations was kindly sent to me by a fellow worker:

The father's hair went perfectly white at the age of 21. He was feared or and disliked by all his children. He took to drink after the death of his wife, who died of consumption at the age of about 50. The eldest daughter died of consumption at the age of 20. The second daughter squinted. She was described as of mulish disposition, which she said was in order to be different from her father. The next child, a son, was morbidly shy; he was killed in the war. The youngest daughter was left-handed. She had alopecia areata from 10 to 12 years of age.

Dr. Rivers,[1] tuberculosis officer of the Barnsley district, has drawn attention to the fact that left-handedness and squint are related to the incidence of pulmonary tuberculosis. In the above case it will be noticed that two members of the family died of consumption.

I propose to deal with the significance of these phenomena on another occasion, but I may state that I am firmly convinced of the hysterical nature of concomitant squint, and this is illustrated by a case which answers Dr. Harford's question as to the possibility of curing squint by psychological methods.

A girl of 7 was brought to me at the school clinic by her sister aged 11. The younger child, who had a convergent squint, was cowed and shrinking; the older was more self-possessed, and was able to give a vivid account of the situation at home. The father, a bully, showed his irritation at his child's squint by beating her, which made the squint worse. I took the child upon my knee, petted and comforted her, won her confidence, and in a few minutes the squint of about 25° had disappeared. Nor could it be induced again before we parted, although I conjured up a picture of the unhappy home to which she had to return.

When she attended the clinic a few weeks later I failed to recognize her amongst other children. It seemed to me that she resented this, and the former friendly relations could not be reestablished. She sulked and squinted the whole time. She was offered a penny, but refused to take it. The penny was then put on a table near the door, so that she might take it as she left, if she changed her mind. An hour later I noticed that she had gone and left the penny on the table. This rejection was striking, inasmuch as she was obviously very poor. At the third visit she still squinted. I talked to her as to an adult, expressing my disappointment, and frankly apologized for any shortcomings in my treatment of her, at the same time saying I was quite ignorant as to the nature of my offence. At last she melted, gave a little smile—the only friendly sign since her first visit—blinked her eyes, and the squint had gone. I was delighted, and asked her to accept some pennies as a reward. This gave great offence. She sulked, refused to have anything more to do with me, and though she was again given a chance of taking the pennies unobserved by me, she left the room with a squint and without the pennies. She has not returned to the clinic since that time.

This sort of experience has been repeated on several occasions. I have had recently several children who will squint or recover parallelism on request, and only within the last month I have had a boy of 14 who has been wearing glasses for squint for years, and found them indispensable, and who yet was able to maintain binocular vision without them as soon as his relations with his parents had been readjusted.—I am, etc.,

Southsea, Oct. 20th. W. INMAN.

LUMINAL IN MIGRAINE.

SIR,—The article on luminal in migraine (BRITISH MEDICAL JOURNAL, October 28th, p. 786) by Dr. Wilfred Harris leads me to say that I have had equally good results from the use of this remedy. I first prescribed it in May, 1922, quite empirically on the assumption that as its exhibition had been so successful in epilepsy it might at least do some good in migraine—a paroxysmal neurosis almost as prostrating and disabling as epilepsy itself. I have only so far had occasion to try it on four patients, all men, but the results have certainly exceeded my expectation.

Space prevents my going into the cases in detail, but, with the exception that in only one case was there an aura, the symptoms in each patient were typical of migraine, the hemicrania advancing after a few hours to vomiting and for the time being causing utter prostration. In one patient the attacks occurred roughly every ten days, and in the other three the intervening period varied between three and five weeks.

I saw the first patient in May and the others in June. All were ordered the same dose—namely, half a grain of luminal three times daily—and they have continued taking this amount ever since. The patient, who was accustomed to his bout of migraine every ten days, has only had one attack since—namely, on August 4th—and this was not followed by vomiting, whereas all previous attacks invariably were. The other three patients have up to the present been completely relieved.

In each case errors of refraction had previously been excluded. One of the patients contracted gonorrhoea four years ago, and he had his first attack of migraine two months later. It is only fair to say that while he has been under the influence of luminal he has also been treated for prostatitis, and it is of course theoretically possible—though

[1] *Lancet*, February 12th, 1921.

improbable—that the removal of this toxic focus has contributed towards his relief.—I am, etc.,

London, W., Oct. 30th. REGINALD HEARN, M.D.

PSYCHO-ANALYSIS.

SIR,—Dr. McBride asks two questions in his last letter, and if I do not make some sort of reply I may be accused of running away.

The first asks how the intelligent student is "to reconcile the theory of the unconscious with known physiology." This same wonderful fellow, according to Dr. McBride, visualizes ideas as nerve cells and so on. No one will object to the vision if it does him or anyone else any good, but as he has no facts to support this figment of his imagination he is theorizing in a demoralizing manner. The whole question has been so well discussed by Dr. Hart in his little book that I need not continue further.

The second question assumes for the *n*th time that psycho-analysts suggest ideas to their patients. The only reply required is a direct negative.

After all, it is easy to be destructive and to ask questions. I could put a few to Dr. McBride. I shall not, however, ask him his views as to the nature of dreams. He might reply with a list of literature which would be almost endless. Freud has summarized it in the first chapter of his book, and how futile it all is! Nor shall I ask him the nature of hysteria, for the above reason also. But I would very much like to know the opinions of himself and his friends regarding obsessions and phobias—their origin, theoretical explanation, and treatment.

I shall be pleased to read any books I may be referred to on the subject, with one exception only—that the word "unconscious" is not to be mentioned therein.—I am, etc.,

City of London Mental Hospital, near Dartford, Kent, Oct. 29th. R. H. STEEN.

REGISTRATION OF DENTISTS.

SIR,—I shall be obliged if you will allow me to call attention to the following points:

1. On November 1st notices were issued to dentists registered *on or after July 28th, 1921*, reminding them that a fee of £5 is payable if they desire their names to be retained on the *Dentists Register* for 1923. If there are any of these persons who have not received a notice in course of post they should communicate with this office without delay.

2. All applications for dental registration under Section 3 of the Dentists Act, 1921, must be made within the interim period. The interim period will come to an end on November 30th, and any persons who desire to make application and have not yet done so should write without delay.

3. The *Dentists Register* for 1923 will be published at 10s. 6d., or post free 12s. Copies, however, which are ordered and paid for prior to January 1st, 1923, will be supplied at 7s. 6d., or post free 8s. 6d.—I am, etc.,

Dental Board of the United Kingdom, 44, Hallam Street, London, W.1, Oct. 19th. NORMAN C. KING, Registrar.

Universities and Colleges.

ROYAL COLLEGE OF PHYSICIANS OF LONDON.

AN ordinary quarterly Comitia of the Royal College of Physicians of London was held on Thursday, October 26th, at 5 p.m., the chair being taken by the President, Sir Humphry Rolleston.

The following candidates were admitted as Members:

Mahomed Khalil Abdel-Khalik, L.R.C.P., Alexander Gordon Biggam, O.B.E., M.B.Edin., Rowland Hill Coombs, M.D.Durh., L.R.C.P., Stuart Jasper Cowell, M.B.Camb., L.R.C.P., Arthur Henry Douthwaite, M.B.Lond., L.R.C.P., Wm. Noel Goldschmidt, L.R.C.P., George Norman Lorimer, M.C., M.B.Melb., Henry Fitzgerald Maudsley, M.D.Melb., Hamilton Morton, M.B.Belfast, Percival Brooke Mumford, M.B.Manch., Robert Cecil Priest, M.B.Camb., L.R.C.P., James Maclure Smellie, M.D.Edin., William Stobie, O.B.E., M.D.Edin., Donald Woods Winnicott, L.R.C.P., Lewis Ralph Yealland, M.D.Ontario.

Licences to practise physic were granted to the following 127 candidates who had conformed to the by-laws and regulations and had passed the required examinations:

M. A. Afifi, J. H. André, P. B. Atkinson, Hawah K. N. Attaoullah, J. R. Azudia, R. A. de C. Basto, W. Beaumont, A. O. Bekenn, F. J. Biddle, H. Boger, E. B. Brooke, A. W. Brown, Margaret M. Brownstone, A. G. Bull, Gertrude B. G. Carden, C. O. Carson, N. E. D. Cartledge, S. A. R. Chadwick, Grace D. Chambers, E. F. Chapman, J. R. Chaudhri, J. Cohen, J. Cohen, M. J. Cohen, F. M. Collins, J. L. Cox, Eleanor M. Creak, A. L. Crockford, H. P. Daly, D. Davidson, D. A. Davies, F. Davies, Kathleen F. Davies, G. Denton, Enid M. Dixon, J. H. Doggart, Alice E. Dove, Winifred Ealand, A. M. Edwards, C. Fenwick, L. French, Lydia S. Fuller-Maitland, I. W. Gallant, C. P. R. Gibson, W. Girgis, S. Glass, Janet V. Good, J. Griffiths, A. W. Hall, H. A. H. Harris, H. W. Harvey, J. K. Hasler, E. Haworth, Evelyn N. Heather, F. J. Hector, H. S. Hogg, W. G. R. Hore, W. E. Howell, F. Hudson, K. E. A. Hughes, D. M. Hutchinson, M. B. Jay, A. D. W. Jones, S. P. Joshi, C. L. Kark, R. W. C. Kelly, F. I. Labieb, Gladys M. Lambourne, H. D. Dawson, Catherine E. L. Lendrum, E. G. Lewis, E. Liston, J. L. Livingstone, A. E. Lorenzen, F. Louis, G. S. Lund, Mary C. Lynch, Elizabeth K. Mackay, Elizabeth McKerrow, Elizabeth Maitland-Jones, R. Manners, A. W. Marrison, V. M. Matthews, H. C. Meathrel, E. B. Messinier, Mary Michael, A. A. Moncrieff, Herta Moos, J. A. Morton, Lily Moss, K. 'Olafsson, Dorothy Pantin, I. N. O. Price, A. B. Rao, J. W. Rigby, C. V. D. Rose, J. S. Salt, C. Satyaraju, H. S. Savage, Eileen M. Saxton, J. Seelenfreund, I. A. Senanayeke, D. G. Sharp, P. H. Sharp, C. Shepherd, H. L. Shepherd, D. K. Shuttleworth, A. E. Slater, G. M. Stoker, Emma M. Store, A. G. Story, B. H. Stribling, H. Summers, H. J. V. Sutton, C. G. Taylor, Agnes W. O'D. Thomas, M. A. Townshend, Lendal Tweed, W. J. Vickers, A. H. C. Visick, Doreen G. C. Walker, J. A. Walker, S. F. Wickramasinghe, W. G. Wickremesinghe, Helen P. Wilkinson, E. Williams, Caroline I. Wright.

On the recommendation of the Council, Dr. J. H. Drysdale was appointed an Examiner in Medicine.

Communications were received from the Secretary of the Royal College of Surgeons reporting proceedings of the Council of that College on July 27th and October 12th; from the Secretary of the College of Preceptors, thanking the College for the assistance given by its representatives on the joint committee on the Physical Education of Girls (BRITISH MEDICAL JOURNAL, August 19th, pp. 321 and 316); from the Secretary of the Conjoint Board of Scientific Societies, submitting a scheme for the reconstitution of the Board, asking for observations thereon.

On the motion of the Senior Censor, it was resolved to restore the Licence of the College withdrawn from Thomas Stoney Sharpley in April, 1919.

The Registrar moved, for the second time, that By-law No. CXIV, relating to candidates for the membership, be repealed. The by-law reads as follows:

> "No candidate shall be admitted to examination who is engaged in trade, or makes any arrangement with a chemist or any other person for the supply of medicines, or who practises medicine or surgery in partnership, so long as that partnership shall continue."

This was passed for the second time, and the by-law accordingly is now repealed.

On the nomination of the President, Professor E. H. Starling was appointed to deliver the Harveian oration, and Dr. John Hay to deliver the Bradshaw lecture.

At the suggestion of the President it was decided to hold a conversazione in the College in November.

The arrangements in regard to the Lloyd Roberts lectureship and the legacy left for this purpose were approved in accord with counsel's opinion.

Reports were received from the Committee of Management recommending the adoption of new regulations for the Preliminary Examination in General Education, and for the Pre-medical Examination in Chemistry and Physics, together with the revised synopses of chemistry and physics, to come into force on January 1st, 1923. The Committee also recommended the adoption of new regulations of professional study for the diplomas of L.R.C.P. and M.R.C.S., together with the synopses of anatomy and physiology and the syllabus of the course of instruction in general biology.

Dr. R. A. Young was appointed a member of the Committee of Management in the place of the late Sir James Galloway.

After some formal college business had been transacted the President dissolved the Comitia.

UNIVERSITY OF OXFORD.

THE Faculty of Medicine has re-elected Sir Frederick Andrewes, D.M., Pembroke College, F.R.S., to be a member of the Board of Electors to the Professorship of Pathology.

An award of the Francis Gotch Memorial Prize will be made in the present term.

The Wilde Reader in Mental Philosophy announces that Monsieur Emil Coué will lecture for him on the subject of "Suggestion" in the Examination Schools on Saturday, November 25th, at 12 noon.

Radcliffe Prize, 1923.—The conditions for the award of this prize were printed in our issue of October 7th, 1922 (p. 664). Candidates are required to send in their memoirs to the Assistant Registrar of the University, Clarendon Building, Broad Street, Oxford, on or before Friday, December 1st, 1922. The intended date of the award is March 20th, 1923.

Degree Days.—The following are the Degree Days in the present term: Thursday, November 2nd; Saturday, November 18th; Thursday, November 30th; Saturday, December 16th.

UNIVERSITY OF CAMBRIDGE.

THE total entry of new students at Cambridge is reported to be unprecedented; there are this term 1,589, as compared with 1,491 last year. The matriculation figures for the six largest colleges are as follows: Trinity, 212; St. John's, 131; Gonville and Caius, 118; Christ's, 110; Emmanuel, 109; Pembroke, 106. Jesus and Clare have 86 each, Trinity Hall 73, King's 71, and no college has less than 43 new students. Non-collegiate students number 58. Separate figures for medical students have not been issued.

Draft regulations for the admission of women to the titles of degrees, in accordance with last year's decision, have been prepared and presented to the Senate.

The munificent bequest of the late Mr. A. Marmaduke Sheild to the Cambridge Medical School was noted in our last issue at page 832.

At a congregation held on October 27th the following medical degrees were conferred:

M.D.—M. S. Thomson.
M.B., B.Ch.—H. D. Gardner.
B.Ch.—*H. E. Cresswell.

* Admitted by proxy.

VICTORIA UNIVERSITY OF MANCHESTER.

Dr. E. J. Sidebotham, who recently resigned the post of deputy director of the public health laboratory, has been appointed honorary lecturer in public health.

Dr. G. J. Langley has been appointed honorary assistant lecturer in experimental physiology.

The Leech Fellowship has been awarded to C. D. Hough, M.B., Ch.B., and the entrance scholarships in medicine to Florence V. Stephen and N. S. Walls.

UNIVERSITY OF LONDON.

Mr. H. J. Waring, M.S., F.R.C.S., has been elected Dean of the Faculty of Medicine for the period 1922–24.

Lectures on Secretions and Internal Secretions.—A course of eight lectures on "Secretion and Internal Secretion" will be given by Professor Swale Vincent, M.D., D.Sc., Professor of Physiology in the University, at Middlesex Hospital Medical School, Union Street, at 5 p.m., on Mondays and Thursdays, November 6th, 9th, 13th, 16th, 20th, 23rd, 27th, and 30th. Attendance at this course is recognized in connexion with the B.Sc. (Honours) Degree in Physiology. Admission is free without ticket.

UNIVERSITY OF LEEDS.

The University Council has appointed Miss E. M. Hickman, M.B., Ch.B., to be Demonstrator in the Department of Pathology and Bacteriology, and Mr. R. B. Tasker Honorary Demonstrator in Anatomy for dental students.

ROYAL COLLEGE OF SURGEONS OF ENGLAND.

Notice has been given on behalf of the Society of Members of the Royal College of Surgeons of England that the following motions will be submitted at the annual meeting of Fellows and Members which, as already announced, will be held at the College, Lincoln's Inn Fields, on Thursday, November 16th, at 3 p.m.:

1. That this thirty-fifth annual meeting of Fellows and Members again affirms the desirability of admitting Members to direct representation on the Council of the College, which (as now constituted) only represents those Members who also hold the Fellowship; and that it does so in order that the constitution of the Council of the Royal College of Surgeons of England shall be in keeping with modern ideas of true representation; further, that as the Royal College of Surgeons is composed of about 18,000 persons, of whom over 16,000 are engaged in general practice, his annual meeting requests the President and Council to nominate at least two Members in general practice to represent the interests of general practitioners on the Council of the College.
2. That this meeting of Fellows and Members requests the President of the College to make a detailed statement here and now as to all the reasons, legal and otherwise, for the Council's refusal to allow representation on the Council of the Members in general practice; and to state whether legal advice has been taken as to any possible means of overcoming any difficulties in the way of carrying out our wishes; and, if so, to declare what that advice was.

The Services.

NAVAL MEDICAL MEMORIALS.

The memorial at the Royal Naval Hospital, Chatham, will be unveiled at 3.30 p.m. on November 11th by Surgeon Vice-Admiral Sir Robert Hill, Medical Director-General R.N., and dedicated by Archdeacon C. W. C. Ingles, D.D., Chaplain of the Fleet.

Owing to changes in the addresses of many temporary medical officers, reserve nursing sisters, and others who subscribed to the fund, it has not been possible to send separate invitations to all. It is hoped that this intimation will be accepted by them, as well as by all friends and relatives of the fallen, as an invitation to attend the ceremony.

ROYAL NAVAL MEDICAL SERVICE.

Fleet Surgeon Joseph H. Whelan, R.N.(ret.), has been awarded the Greenwich Hospital pension of £50 a year in the vacancy created by the death of Fleet Surgeon Peter W. Rolston, R.N.(ret.), on June 13th.

A reunion of the officers of No. 30 General Hospital, B.E.F., is being arranged. It will take place in London on Friday, December 8th, 1922. Those who intend to be present should notify Dr. J. B. McDougall, if they have not already done so in response to the intimations sent out on October 16th.

Dr. Louis Rénon, professor of medical pathology in the Paris Faculty of Medicine, and a well-known writer on tuberculosis, has recently died.

Obituary.

ALEXANDER CRUM BROWN, M.D.Edin., D.Sc.Lond., F.R.S., F.R.S.E., F.R.C.P.E., LL.D.Aberd., Glasg., Edin., St.And.,

Emeritus Professor of Chemistry in the University of Edinburgh.

To the recent graduate of Edinburgh University and to the present-day student there Crum Brown has been simply a name—a name with magnificent memories attached, but still little more than a name. It was far otherwise with the graduates and students of the last three decades of the nineteenth century and the first few years of this century: to them he was the kindly and extraordinarily learned professor of chemistry whose versatility was a proverb; he was to many of them their first teacher in the University; in after years they loved to recall the exciting incidents—the explosions and the malodorous emanations—of his class, and in friendly fashion to try to imitate his method (all his own) of lecturing; for a few obstreperous spirits who came into collision with the University authorities his was the voice which pled for leniency and suggested the extenuating circumstance. His retirement from his Chair in 1908 brought an end to those things; he did not indeed cease to play a part in medical affairs—he was, for instance, president of the Edinburgh Medical Missionary Society for five years from 1911 to 1916—but his intimate relations with student life on a large scale ceased. For several years he has been practically confined to his house, where, however, he was always ready to welcome old friends and talk with all his old vivacity of all sorts of matters. He became seriously ill only some three weeks ago, and the end of a notable life was reached on October 28 h.

Alexander Crum Brown was born on March 26th, 1838, twenty-eight years later than his step-brother, John Brown, M.D., the author of the inimitable *Rab and His Friends* and *Horae Subsecivae*. His father was the Rev. Dr. John Brown, biblical scholar and minister of Broughton Place United Presbyterian Church in Edinburgh; his mother (Dr. Brown's second wife) was the daughter of Alexander Crum of Thornliebank, near Glasgow. He received his education at the Edinburgh Royal High School, at Millhill School, at Edinburgh University (M.A. 1858, M.D. 1861), in London (D.Sc. 1862), and in Germany under Bunsen and Kolbe. In 1863 he began to lecture on chemistry in the Edinburgh Extramural School, and, not having too many students, he was able to give much time to original research in pure and applied chemistry. In 1869 the election of Professor Lyon Playfair as M.P. for Edinburgh and St. Andrews Universities gave the young lecturer his chance, and he was appointed to the vacant Chair of Chemistry in the University. There he worked for nearly forty years, and became famous for many other things besides chemistry. He had already in 1868, along with Dr. (afterwards Sir) Thomas R. Fraser, been awarded the Macdougall Brisbane Medal of the Royal Society of Edinburgh for an investigation on the connexion between the chemical constitution and the physiological action of salts of ammonium (alkaloid) bases. In 1875 he was awarded the Keith Prize for the researches which proved that the semicircular canals of the ear were the origin of the sense of rotation. His M.D. thesis (1861), unfortunately not published till 1878, was on the theory of chemical combinations, and contained much original thought, rather remarkable as the work of a medical student. As summarized by Dr. Leonard Dobbin in *Edinburgh's Place in Scientific Progress* (p. 53, 1921), Professor Crum Brown's original work in chemistry was specially centred in graphic formulae, in the theory of benzene substitution, in the problems of stereo-isomerism, in the electrolytic synthesis of dibasic organic acids, and in the relation of chemical constitution to physiological action (to which reference has been made). He was closely connected with the Royal Society of Edinburgh, and acted as secretary for some years. As has been already shown, Professor Crum Brown did not confine himself to chemistry. To quote the author of *Quasi Cursores* (1883):

"His knowledge of mathematics, of philology, of modern languages, even such as Russian and Chinese, and of church history, is known to his friends, while under the stores of 'general information' there exists an acute 'general' intellectual power that takes kindly, as any Schoolman, to the labyrinthine and the paradoxical; perhaps he believes more than most of us in a region where paradoxes are not only soluble but solved."

This tribute paid to the professor comparatively early in his long life was justified more and more as the years went

by, and stories were current that at dinner parties he discussed matters ranging from Presbyterian paraphrases to Chinese music, and that he once began a series of lectures on the alphabet, but af er several meetings had to stop as he had got no farther than A. How massive was his learning and how widely recognized might be inferred from the numerous honorary degrees which he received, and how greatly beloved he was by his students may be guessed from the fact that to them he was and will ever remain, not "Professor Brown" but "Crummie."

He married Miss Jane Bailie, daughter of the Rev. James Porter, Drumlee, co. Down; she died in 1910. One of the best known photographs of Crum Brown is that which shows him (in 1877) as the centre figure in a once famous club called the "Round Table," with Argyll Robertson, Sir Thomas Fraser, Joseph Bell, and many other Edinburgh notabilities grouped around him. He was very truly the centre for many years of much of the best thought in his Alma Mater, and he had a well-deserved reputation for kindness of heart and sheer goodness which rested upon the surest foundations. It was not for nothing that there ran in his veins the blood of Brown of Broughton Place and that older Brown of Haddington, the author of the *Self-interpreting Bible*.

GEORGE RENDLE, M.R.C.S., L.S.A.,

Late Secretary of the Medical School of St. Thomas's Hospital.

The death of George Rendle in October has removed one who in a kind and unassuming manner exerted an influence on the careers of many generations of St. Thomas's men. He was born in 1843, the son of Dr. William Rendle, the historian of Southwark and incidentally of St. Thomas's Hospital. He was educated at Merchant Taylors School, and later at the medical school of Guy's Hospital, from whence, in 1865, he became a Member of the College of Surgeons and a Licentiate of the Society of Apothecaries.

Four years of private practice in conjunction with his father, however, led him to conclude that he had not found his *metier*, possibly a determination due to his extreme conscientiousness of disposition. He then entered the Civil Service and as a "writer" in the General Register Office he received special commendation. In 1883 he became secretary to the medical school of St. Thomas's Hospital, a post which he held until 1905, and then, as a result of failing health, he relinquished the more responsible duty for the less exacting one of librarian during a further period of eleven years.

Rendle was an actual product of the old "United Hospitals." Entering on his professional life at a time when the two hospitals faced each other in St. Thomas's Street, he witnessed the disappearance of the parent institution and the resurrection at a higher spot on the banks of the Thames of the new St. Thomas's which was destined to absorb his future energies and at which he passed the main portion of his life.

Few men can have entered more devotedly on their duties; he lived for the school, and was its secretary during the years when it was steadily increasing in size, and in point of numbers reached its zenith. He was actively associated with the various structural extensions and improvements necessitated by the unexpected growth of the classes. On him also fell the responsibility of familiarizing a succession of deans with the duties they had undertaken, of maintaining continuity in the policy and administration of the school, and in the evolution of changes called for by the constantly widening scope of the medical curriculum. The intimate knowledge which he acquired of every detail of the regulations governing medical education, and the special requirements of the various universities and licensing bodies rendered him an invaluable colleague, and in consequence it was rare that the dean could fall into error in matters either of advice or action. No less valuable was his association with the younger members of the school; his ripe experience was at the disposal of all who came to him, and he made their interests his own. Loyalty, transparent honesty, and discretion, marked all his actions; punctilious in the fulfilment of every duty and methodical to a degree in the arrangement of his work, he gave of his best freely, while he was kindly and considerate to all. No ungenerous word or careless gossip ever escaped him in his office, the daily meeting place of the staff for so many years, and no one had ever occasion to repent having reposed a confidence in him. His neat carefully-dressed figure was for more than thirty years one of the most familiar objects of St. Thomas's, and was greatly missed by his friends when he retired. His own love for the institution, which he served so long and faithfully, cannot be better illustrated than by the sentence which accompanied the announcement of his death in the *Times*, which asked anyone desiring to send flowers to his grave rather to make a contribution to the Samaritan Fund of the hospital.

LACHLAN G. FRASER, M.D.,

North Shields.

We regret to record the death on October 5th, after a long and painful illness, of Dr. Lachlan George Fraser, who was one of the best known and most highly respected medical men in the north-east of England. Dr. Fraser received his medical education at the College of Medicine, Newcastle-upon-Tyne, and graduated M.B. (honours) and B.S. in 1895, M.D. in 1903, and M.S. in 1904 at Durham University. He joined his uncle, Dr. F. C. Mears, in partnership at Northumberland Square, North Shields, and succeeded to the practice on the death of Dr. Mears two years ago. He held the appointment of honorary surgeon to the Tynemouth Infirmary, an institution to which he devoted a great deal of his time; he had taken an active part in its administrative affairs practically from its foundation. He was the author of many contributions to medical literature, mainly in this Journal, and he was the author of a prize essay on talipes equino-varus in 1903. He took much interest in all kinds of sports and athletics, especially in swimming, and was honorary surgeon to the Tynemouth Amateur Swimming Club.

Dr. Lachlan Fraser had long taken an active interest in the work of the British Medical Association, and filled with distinction every office in the North of England Branch, including that of president. He was secretary of the Tyneside Division of the Association from 1902 to 1913, a period which covers the years of strenuous work during which the National Insurance Bill was under discussion. Dr. Fraser, notwithstanding the calls of a busy practice, did splendid work for the Association during those years and earned the gratitude of his fellow practitioners for his labours. He was elected chairman of the Tyneside Division of the Association in November, 1917, and still held that position at the time of his death. He was for several years a member of the Tynemouth Insurance Committee, and he was elected president of the Northumberland and Durham Medical Society, but never filled the chair, for the first meeting of the session at which he should have presided was on the day of his death. He was one of the very best type of general practitioner, and his loss will be severely felt in an area much wider than his own district. The funeral was most impressive; it was attended by medical men from the whole countryside.

Mr. Hugh Whitwell of Norwich, who died on October 20th at the age of 46, came of an old Yorkshire family. He was educated at Uppingham and Cambridge University, and received his medical training at St. Bartholomew's Hospital. He took the diplomas of M.R.C.S. and L.R.C.P.Lond. in 1901, and subsequently served as house-physician at Bartholomew's Hospital, senior house-surgeon at the Royal Free Hospital, and assistant medical officer to H.M. Prison, Norwich. About eighteen years ago he entered into partnership with Mr. H. S. Robinson and Mr. H. C. Nance in Norwich, and on their retirement he became senior partner, with Dr. B. B. Riviere as his colleague. Some years ago he was appointed to the staff of the Jenny Lind Children's Hospital, to which he was senior surgeon at the time of his death. He served for two and a half years in France during the war, first as medical officer with the Yorkshire Hussars, and afterwards as a surgical specialist at a general hospital. His health gave way under the strain of war service, and he was invalided out of the army in 1918. Before going to France he did valuable work at the Lakenham Military Hospital and as temporary assistant surgeon at the Norfolk and Norwich Hospital. He was a good golfer, and before going to Norwich had played cricket for the Yorkshire Gentlemen. He was also a keen supporter of the Norwich staghounds. He underwent a serious operation on October 16th, and after making substantial progress for two days unforeseen complications arose which caused his death.

Dr. Thomas Carleton Railton, who died at Buxton on October 4th at the age of 78, was educated at the Royal School of Medicine, Manchester, and St. Bartholomew's Hospital. He took the diploma of M.R.C.S.Eng. in 1869, and

proceeded to the F.R.C.S. in 1872; he graduated M.B.Lond. in 1873 and M.D. in 1882, and in the latter year he also graduated B.Sc.Vict.; in 1888 he took the diploma of M.R.C.P.Lond. Dr. Railton was formerly in practice at Manchester, and held appointments on the honorary staff of the Northern Hospital for Women and Children, to which institution he was at the time of his death a consulting physician. He retired from medical practice some years ago and went to live in Buxton. He was the author of many contributions to current medical literature and of several works on diseases of children.

THE death took place suddenly on October 19th of Dr. JOHN GEORGE WALLACE-JAMES, of Tyne House, Haddington, eldest son of the late Dr. Robert Wallace-James, H.E.I.C.S. Dr. Wallace-James received his medical education at the University and Royal College of Surgeons of Edinburgh. He had been in practice for some years at Haddington, and was held in high regard in the district. The funeral, which took place on October 23rd, was attended by the Provost, magistrates, town council, and by other public bodies in Haddington.

Medical News.

AT the annual dinner of the London School of Tropical Medicine on Wednesday, Sir Arthur Robinson, of the Ministry of Health, said that a scheme was under consideration whereby the London School of Tropical Medicine would be incorporated with the new Institute of Hygiene, founded with the assistance of the generous gift made by the Rockefeller Fund. The amalgamation, however, must be on such a basis as to secure the continuance of the great work done by the school. Sir Havelock Charles said that if the aspirations of the school were met the adhesion of the staff and students to the new arrangement would be freely given.

LECTURES on tropical hygiene in its relation to the public health service will be given at the Royal Sanitary Institute, 90, Buckingham Palace Road, S.W., at 4 p.m., on November 20th, 21st, 22nd, 23rd, and 24th, by Dr. Andrew Balfour, Lieut.-Colonel W. W. Clemesha, Professor R. T. Leiper, Lieut.-Colonel H. J. Walton, and Dr. H. B. G. Newham. The lectures will be illustrated by lantern slides and films; they are primarily intended for sanitary inspectors.

THE annual dinner of past and present men students of Leeds Medical School will be held at the Queen's Hotel on Friday, November 17th, at 7 p.m., when Dr. Watson will be in the chair. This is the thirty-ninth annual dinner, and the continued support of past students is asked for. Tickets, 10s. each, exclusive of wine, may be obtained from the honorary secretaries, Mr. J. Shutt and Mr. G. F. Walker, Medical School, Leeds. Guests may be invited, who need not be members of the medical profession.

THE twenty-seventh Congress of the Italian Society of Internal Medicine was held at Florence from October 21st to 24th, when the following subjects were discussed: duodenal ulcer, introduced by Professor Ascoli; jaundice, introduced by Professors Caporali and Zoia.

A CONGRESS of French-speaking dermatologists will be held at Strasbourg from July 25th to 27th, 1923, on the occasion of the centenary of Pasteur. Further information may be obtained from Professor Pautrier, 2, quai Saint-Nicolas, Strasbourg.

THE Wellcome Museum of Tropical Medicine and Hygiene, Wellcome Bureau of Scientific Research, 26, Endsleigh Gardens, N.W.1 (near Euston Station), gives a graphic presentation of tropical medicine and hygiene, and is open during the week to all medical men from 9.30 a.m. to 5.30 p.m. (Saturdays 9.30 a.m. to noon). On Wednesdays at 2 p.m. visitors will be shown round the museum by the curator.

THE *London Gazette* announces that Dr. Hyman Finklestone Sayliss, formerly known as Hyman Finklestone, has by deed poll assumed the surname of Sayliss in addition to that of Finklestone.

THE King Edward VII Hospital Fund has made a further distribution of £100,000 out of the proceeds of the Hospitals of London Combined Appeal, making, with £150,000 distributed on August 3rd, a total to date of £250,000. The hospitals are being informed that, in accordance with the original scheme of the appeal, the grants are based, *inter alia*, on the number of occupied beds and out-patient attendances, and on the evidence as to their general efficiency, financial needs, and the efforts made to assist the appeal; but that neither the first payment on account, nor the first and second taken together, will necessarily represent the judgement of the King Edward Fund as to the proportions in which the ultimate total proceeds of the appeal should be allocated.

A DANCE in aid of the Westminster Hospital Students' Union will be held at Princes' Galleries on Friday, November 24th, at 9 p.m.

THE dinner of the past and present students of the Royal Dental Hospital of London will be held at the Trocadero Restaurant on Saturday, November 25th, at 6.30 for 7.0 p.m., when Mr. P. L. Webster will preside.

THE annual dinner of the medical staff of the Central London Throat and Ear Hospital was held at the Trocadero Restaurant, London, on October 26th, with Dr. James Atkinson in the chair. After the loyal toasts had been honoured, the chairman proposed the health of "The Guests" in felicitous terms, and Mr. W. J. G. Nourse and Dr. W. H. Kelson replied. The toast of "Our Hospital" was proposed by Sir Sydney Russell-Wells, who made a plea for a better organization of post-graduate education in London by co-operation among the special hospitals. Sir James Dundas-Grant replied, and Mr. Kershaw, secretary to the hospital, contributed some amusing reminiscences. During the course of the evening a presentation of a silver loving cup was made by Dr. A. Wylie, on behalf of the medical staff, to Mr. W. Stuart Low, who recently retired from the active staff of the hospital.

THE late Mr. Wilfred Stones, of Wilmslow, Cheshire, who died in July last, leaving net personalty of £55,636, has left the residue of his estate to be divided into ten parts, three for the Manchester Royal Infirmary, two each for St. Mary's Hospital, Manchester, and the Children's Hospital, Manchester, and one part each to the Manchester Eye Hospital and the Northern Counties Hospital for Incurables, Mauldeth, and one part between Christ's Hospital Cancer Pavilion and the Manchester and Salford Hospital for Skin Diseases.

THE first meeting of the new session of the Röntgen Society will be held at the Institution of Electrical Engineers, Savoy Hill, Victoria Embankment, W.C., on November 7th, at 8.15 p.m., when the presidential address will be delivered by Sir Humphry Rolleston, K.C.B., on acute constitutional symptoms due to radiations.

THE annual dinner of the Cambridge Graduates' Club of St. Bartholomew's Hospital will take place on Friday, November 24th, at 7.30 p.m., at Hotel Victoria (King Edward VII Rooms), with Dr. Herbert Williamson in the chair. The honorary secretaries are Dr. H. N. Burroughes and Mr. Reginald M. Vick.

THE *London Gazette* announces that the Lord Chancellor has appointed Lieut.-Colonel Nathan Raw, C.M.G., M.D., to be a Medical Visitor of Lunatics so found by inquisition.

THE Metropolitan Borough of Holborn has called a conference on rat repression to be held in the council chamber at the municipal offices, 197, High Holborn, W.C.1, on Monday, November 6th. The chair will be taken at 3 p.m. by the Mayor.

IN consequence of the Parliamentary election the meeting of the Dental Board of the United Kingdom has been postponed from November 14th to November 21st.

THE fourth edition of *Physiology and Biochemistry in Modern Medicine*, by Professor J. J. R. Macleod of Toronto, is in the press and will shortly be issued by Mr. Henry Kimpton. The same publisher is about to publish the tenth edition of Dr. C. E. Simon's *Manual of Clinical Diagnosis by Means of Laboratory Methods*.

A CELEBRATION of the centenary of the birth of Pasteur is to take place in Philadelphia on December 27th, 1922. The provisional programme includes a meeting in the afternoon at the Academy of Medicine and a banquet in the evening, at both of which there will be distinguished speakers.

PROFESSOR LACASSAGNE has bequeathed to the city of Lyons his library, which numbers upwards of 12,000 volumes, and is particularly rich in documents relating to criminal anthropology.

SIR ALMROTH WRIGHT, M.D., F.R.S., will deliver the occasional lecture before the Royal Society of Medicine on Thursday, November 30th, and has chosen "New principles in therapeutic immunization" as the topic. The chair will be taken by the president, Sir William Hale-White, at 5 p.m.

THE *Handbook of Leprosy*, by Dr. Ernest Muir, reviewed last week (p. 805), is published in this country by H. K. Lewis and Co. at the price of 10s. 6d.

THE late Dr. Matthew Mitchell Bird, formerly medical superintendent of St. Mary's Hospital, Paddington, has bequeathed the residue of his estate, about £10.000. to St. Mary's Hospital for general purposes.

Letters, Notes, and Answers.

As, owing to printing difficulties, the JOURNAL *must be sent to press earlier than hitherto, it is essential that communications intended for the current issue should be received by the first post on Tuesday, and lengthy documents on Monday.*

ORIGINAL ARTICLES and LETTERS *forwarded for publication are understood to be offered to the* BRITISH MEDICAL JOURNAL *alone unless the contrary be stated.*

CORRESPONDENTS who wish notice to be taken of their communications should authenticate them with their names—of course not necessarily for publication.

AUTHORS desiring reprints of their articles published in the BRITISH MEDICAL JOURNAL are requested to communicate with the Office, 429, Strand, W.C.2, on receipt of proof.

IN order to avoid delay, it is particularly requested that ALL letters on the editorial business of the JOURNAL be addressed to the Editor at the Office of the JOURNAL.

THE postal address of the BRITISH MEDICAL ASSOCIATION and BRITISH MEDICAL JOURNAL is 429, Strand, London, W.C.2. The telegraphic addresses are:

1. EDITOR of the BRITISH MEDICAL JOURNAL, *Aitiology, Westrand, London*; telephone, 2630, Gerrard.
2. FINANCIAL SECRETARY AND BUSINESS MANAGER (Advertisements, etc.), *Articulate, Westrand, London*; telephone, 2630, Gerrard.
3. MEDICAL SECRETARY, *Medisecra, Westrand, London*; telephone, 2630, Gerrard.

The address of the Irish Office of the British Medical Association is 16, South Frederick Street, Dublin (telegrams: *Bacillus Dublin*; telephone, 4737, Dublin), and of the Scottish Office, 6, Rutland Square, Edinburgh (telegrams: *Associate, Edinburgh*; telephone, 4361, Central).

QUERIES AND ANSWERS.

INCOME TAX.

"G. M." has appealed against his assessment and has been asked by the local inspector to furnish statements based on bookings less bad debts.

*** It is universally agreed that the calculation of a proper allowance for bad debts in the case of a medical practitioner is always speculative and generally unsatisfactory. For this reason it was agreed on behalf of the Board of Inland Revenue some time ago—and also more recently (see our issue of November 19th, 1921)—that unless special circumstances existed objection should not be raised to basing assessments on cash receipts instead of bookings less bad debts. In the long run no difference in the amount of tax paid should occur, but it is dangerous to change from one basis to another. It is agreed that the cash basis is unfair to the revenue in the case of a new practice or a change in proprietorship, but unless there are some special circumstances of that kind "G. M." should press for the acceptance of the normal basis. In any case the "income" on which tax is paid is the earnings in respect of the year of assessment and not for the year when the fees were booked or paid.

"J. McC.," who left the army service and went into general practice as a partner, cannot average his own previous earnings, but must take his liability as determined by his share of the average profits of the practice. The averaging of past army earnings applies only where the civil earnings are received as employee—as in the case of "J. O'L. M.," referred to in our issue of October 14th, 1922.

"F. E. D." bought a 15-h.p. Overland two-seater for £225 in 1916. In 1921 he sold this for £ 00, and bought 11.6-h.p. four-seater Standard for £595. The cost of a two-seater Overland in 1921 would have been £475.

*** The allowance due is £475 − £100 = £375. The inspector of taxes might be reminded that the official witness before the Royal Commission on Income Tax gave evidence to the effect that allowances for cost of replacement would be calculated by reference to the then, and not the original, cost of the plant or machine replaced.

LETTERS, NOTES, ETC.

PSYCHO-ANALYSIS.

DR. V. T. CARRUTHERS (Derby) writes: In asking for an anti-Freudian who has seriously studied the subject and given his views in a book, Dr. Steen (October 21st, p. 775) appears to have overlooked Pierre Janet's *Médications Psychologiques* (1919), vol. ii, chap. 3.

SWEATING IN PULMONARY TUBERCULOSIS.

DR. J. PIRIÉ (Hanbury, Leamington Spa) writes in answer to "Irishman" (October 21st, p. 780): "If he has not done so it is worth while to try the effect of a glass of milk punch before retiring (a glass of cold milk with three or four teaspoonfuls of good old Cognac). A method recommended by Dr. William Porter is worth remembering—namely, note the time of the beginning of the sweating, wake patient a few minutes before and give him two tablespoonfuls of whisky. It may seem strange to recommend stimulating remedies like milk punch to prevent night sweats, but it must be remembered that in phthisis the tachycardia of the day is generally succeeded by a bradycardia at night. 'Irishman' says the hygienic conditions of his patient are superb, therefore it is not necessary to refer to the importance of hygienic bedding, coverings, and clothes, and the value of real 'open-air' treatment in preventing sweats. As to medicines, has he tried agaricin gr. 1/20 six hours before sweating is expected, or atropin gr. 1/100?"

DERMATITIS AMONGST CEMENT WORKERS.

IN reply to Dr. Dykes's inquiry (October 28th, p. 826), Dr. James Liddell (London, N.) sends the following extract from *Diseases of the Skin*, by Stelwagon: "Among other trades and workmen a variable dermatitis or cutaneous injury may result: an eczematoid eruption in builders, plasterers, and bricklayers from the plaster, lime, and cement."

THE MILK OF JERSEY COWS.

IN opening a discussion on the food value of milk at the National Milk Conference, Dr. Robert Hutchison is reported to have said (BRITISH MEDICAL JOURNAL, October 28th, p. 821) that he had "found the milk of Jersey cows specially likely to produce bilious trouble on account of its richness." The Honorary Organizing Secretary of the South-Eastern Jersey Club writes to inform us that at a dinner of the Club the suggestion that Jersey milk was deleterious to children was very strongly controverted by several speakers, among them Dr. Harry Corner, who said that he had kept a Jersey herd for twenty-five years, and had never had an infant or child who could not take Jersey milk when properly administered, even after other milk and milk substitutes had failed.

MEDICAL AID FOR RUSSIAN REFUGEES.

MR. D. ZINOVIEFF (Special Delegate of the Russian Red Cross for Great Britain) and Dr. B. BELILOVSKY, (Medical Adviser to the Russian Red Cross), write: The Russian Red Cross Society (Old Organization) makes an urgent appeal at the present time to all kind friends and sympathisers for help for the destitute Russian refugees. These unfortunate persons, deprived of their own mother country, are scattered all over the world. The above society is doing its utmost to provide at least the minimum of help necessary, but is greatly handicapped by lack of funds. The majority of the Russian refugees are living in Serbia, Bulgaria, and other Balkan States. Though helped to a certain degree by the Governments of these countries, they are in a very distressed condition. One of their chief needs is medical help, for which surgical instruments are very sadly lacking. Thousands are suffering and help is urgently needed. The Russian Red Cross, therefore, plead for assistance by donations in money or in surgical instruments—even old and used ones. Such donations will be most gratefully received at the offices of the society, Chesham House, Chesham Place, London, S.W.1.

MEDICAL GOLFING SOCIETY.

THE autumn meeting of the Medical Golfing Society was held at Littlestone-on-Sea on October 21st, and was a great success. The results were as follows. Singles *v.* Bogey (cup presented by Mr. Ernest Clarke), won by Mr. H. D. Gillies, 1 up; second, Mr. T. P. Kolesar and Dr. E. Grogono, 2 down. Foursomes *v.* Bogey (cups presented by Mr. G. Dawson and Dr. Rolf Creasy), won by Dr. L. W. Bathurst and Mr. E. Laming Evans, 4 down, after a tie with Mr. L. Bromley and Mr. F. D. Saner, and with Dr. E. Grogono and Dr. L. Welply, at 5 down. Challenge cup for best 18 holes medal round (presented by Mr. E. Canny Ryall), won by Dr. J. Grace, 87 − 9 = 78; second, Sir Milsom Rees, 83 − 4 = 79; third, Mr. E. Laming Evans, 89 − 9 = 80. All competitions were played under handicap.

VACANCIES.

NOTIFICATIONS of offices vacant in universities, medical colleges, and of vacant resident and other appointments at hospitals, will be found at pages 38, 39, 35, and 40 of our advertisement columns, and advertisements as to partnerships, assistantships, and locumtenencies at pages 36 and 37.

A short summary of vacant posts notified in the advertisement columns appears in the *Supplement* at page *171*.

SCALE OF CHARGES FOR ADVERTISEMENTS IN THE BRITISH MEDICAL JOURNAL.

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Advertisements should be delivered, addressed to the Manager, 429, Strand, London, not later than the first post on Tuesday morning preceding publication, and, if not paid for at the time, should be accompanied by a reference.

NOTE.—It is against the rules of the Post Office to receive *poste restante* letters addressed either in initials or numbers.